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PA OF THE AUCKLAND ISTHMUS: AN ARCHAEOLOGICAL ANALYSIS

AILEEN FOX

AUCKLAND INSTITUTE AND MUSEUM

Abstract. The construction and defensive methods of the Maori terraced pa on the volcanic cones on the Auckland isthmus is discussed in the light of recent field surveys. A group with late earthwork defences is defined, comprising Mt Hobson, Mt St John, Mt Wellington and One Tree Hill. The archaeological dating evidence is compared with the historical evidence based on Maori oral traditions recorded in the Orakei judgement of 1869.

This article originated as the Roger Buddle Memorial lecture for 1976, given under the auspices of the Anthropology and Maori Studies section of the Auckland Institute and Museum. The subject, the Maori pa of the Auckland isthmus, was chosen partly for its appeal to a local audience but mainly because of the need for an archaeological analysis of a group of outstanding sites, based on fresh fieldwork and incorporating recent advances in knowledge.

The Auckland isthmus (Fig. 1) consisting of a narrow 15 km strip of land between the Waitemata and Manukau harbours, is dominated by a series of isolated small hills, the products of a long period of intense volcanic activity, dating from the late pleistocene period. Concealed within their conical outline, there are the craters from which the ash and scoria were extruded and in many instances the direction and extent of the lava flows are known (Searle 1964, p. 37, fig. 6). The rapid growth of the city of Auckland in the 20th century has engulfed the hills, which now rise from a sea of small houses as focal points in a unique urban landscape.

For the Maori people these volcanic hills were an open invitation for settlement; their steep slopes offered ready-made defence, the surrounding flat land enriched by the volcanic deposits provided workable fertile soils for cultivation, and the nearby waters of the Waitemata and Manukau harbours were a rich source of seafood as well as an easy means of travel among the islands of the Hauraki Gulf and along the coasts. Such generalisations are familiar and obscure the fact that archaeologically very little is known about the Maori settlement of the Tamaki isthmus or about the sites individually. No major research excavation has been done; work has been limited to salvage undertaken in advance of road making and reservoir building on Mount Roskill in 1961, on Mount Wellington in 1960, 1965 and 1971-72 and more recently in advance of quarrying on Elletts Mountain in 1974-75; the full results have not yet been published. Thus the cones still constitute a challenge to the practising archaeologist.

It must be remembered that much of the archaeological record is missing or is imperfect. Out of the 36 known Maori settlements on the volcanic cones (Fig. 1), 15

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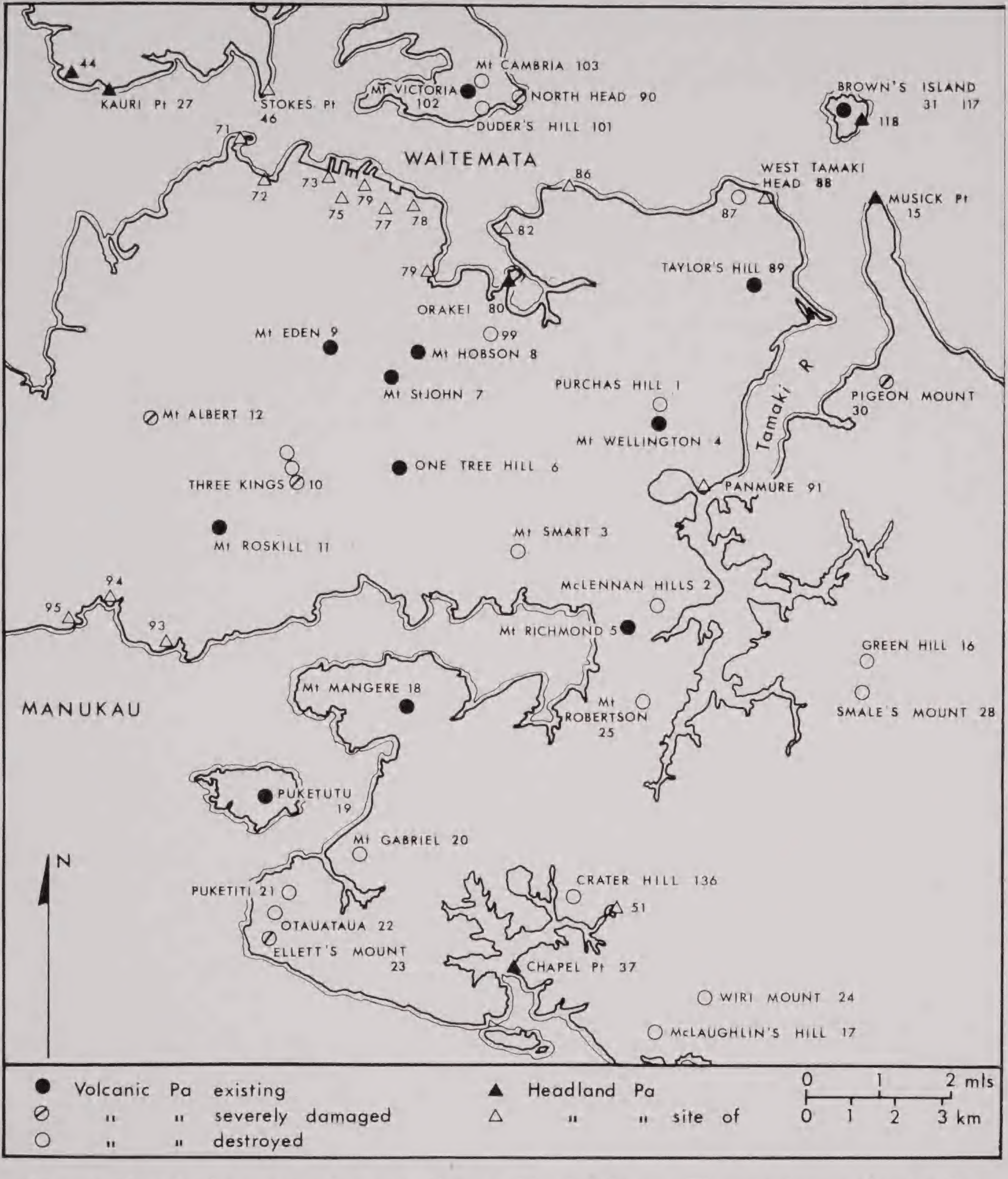

Fig. 1. Distribution map of pa on the Auckland isthmus. The numbers refer to the N.Z. Archaeological Association's site records, on NZMS map N42.

have been quarried away this century to satisfy the demand for scoria in road-making. Others have been severely damaged by the construction of reservoirs and roads, by quarrying and by house building on the periphery. The magnitude of the city's loss can best be appreciated by comparing the magnificent landscape of the Three Kings painted by the Rev. John Kinder (Fig. 2) in 1856 with its present state. The terracing and summit platforms of the pa were then clearly visible, crowning each of the three hills. Today all that remains is the wooded stump of the central 'King' topped by an incongruous water tower, the rest has been reduced to scoria. Green Mountain, Mount

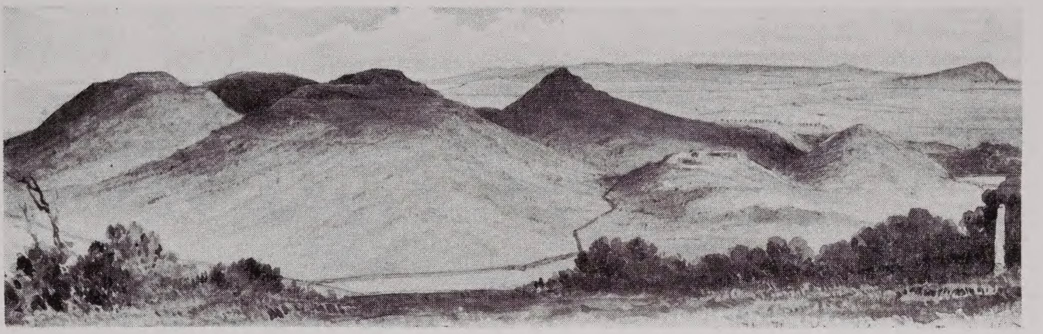

Fig. 2. 'The Three Kings volcanic crater, Auckland'. Watercolour by Rev. J. Kinder, *c.* 1856, showing the three terraced pa. (Reproduced by permission of Auckland City Art Gallery).

Smart, Mount Gabriel and Wiri Mountain, are among similar casualties. Furthermore, as the distribution map shows (Fig. 1), settlement on the cones is only part of the prehistoric pattern; many of the numerous headlands on the shores of the Waitemata were occupied, and were fortified by means of a transverse ditch and bank on the landward side. Of these only the pa on Musick Point, Kauri Point, and at Castor Bay, ca. 7.5 km north of North Head, have survived more or less intact. Excavation of Rahopara pa at Castor Bay (N38/20), where a radio-carbon date of a.d. 1492 ± 60 was obtained from the early open settlement which preceded the defences (Davidson 1974, p. 144; Green 1970, p. 2), has indicated that some of these small settlements were occupied at the same time as the large ones on the volcanic hills.

The Terraced Pa

The Maori pa on the cones are known as 'terraced pa'; comprising Class 1 of the classification set out by Groube (1970, p. 142). These rely for defence on a series of artificially steep slopes made by cutting back into the hillside and using the soil so obtained to heighten the scarp below. In so doing, a level terrace was built up which not only provided a stance for the defenders, but also a suitable flat place for house building or for stores. A succession of such terraces produced the stepped profile characteristic of the cones and of many other pa elsewhere. These defences could be supplemented by a timber palisade erected on the outer edge of the terrace; postholes for such work were observed at the summit of One Tree Hill, when the monument to the Maori people was set up in 1940 (Fairfield 1941, p. 94), and were located on Mount Roskill in the rescue excavations in 1961 (Shawcross 1962, p. 81). However, work on Mount Wellington in 1971-72 showed that these were absent on two of the lower terraces (Davidson 1975, p. 12). It is also evident from the intermittent character of much of the terracing and from the frequency of storage pits and probable house sites, that defence became a secondary consideration in some sectors.

Mount Eden (Figs. 3, 4, 5) may first be examined as an outstanding example of a terraced pa. The Maori name, Maungawhau, means the hill of the whau tree *(Entela aborescens)*. The settlement occupied the whole of a volcanic complex, built up over a period of time from three vents, 0.75 km long and 196 m high at the summit, with the long axis approximately south to north. It includes a deep conical crater at the southern end and there was formerly a second shallow one farther north now filled in by a reservoir. The crest of the hill was not flat; there are massive scoria

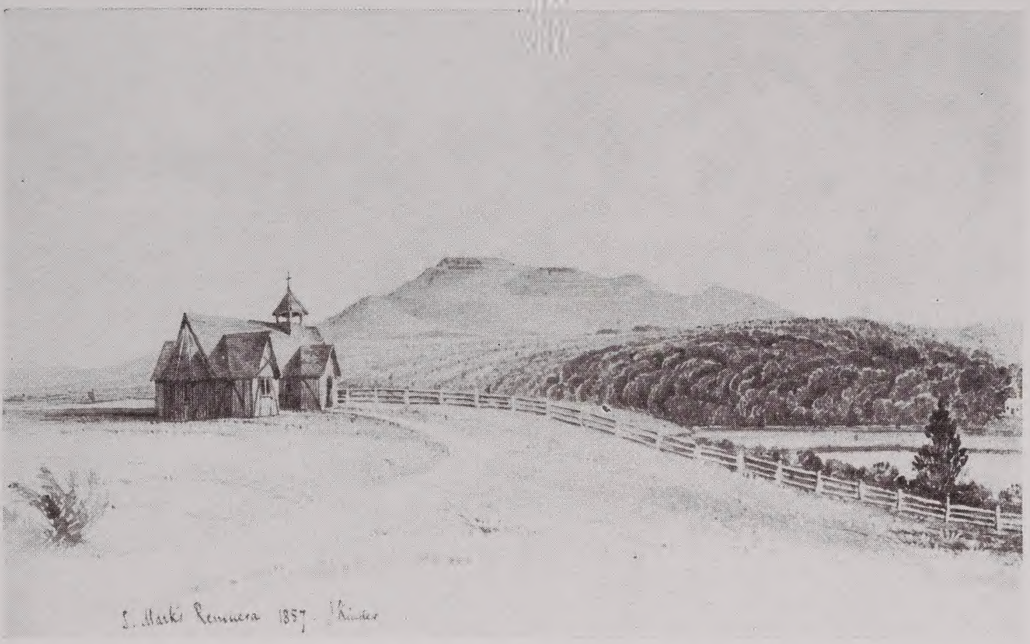
S. Mark's Remuera 1857. J Kinder

Fig. 3. 'St. Mark's, Remuera', Watercolour by Rev. J. Kinder, 1857, showing in the background Mount Eden terraced pa with strong points and two craters. (Reproduced by permission of Auckland City Art Gallery).

mounds which formed four prominent knobs on the descending spine. These produced its distinctive outline as recorded, from Remuera in 1857 in a water colour by the Rev. John Kinder (Fig. 3), before it was obscured by trees and damaged by quarrying.

The defences consist of three, and in places four, close-knit lines of terracing on the external slopes. These are not continuous around the entire perimeter of the mountain but are broken up and dovetailed one into the other, in order to accommodate to the changes in the contours. In some places, terracing stops on either side of a very steep slope, as visible in the air photo (Fig. 4). The work does not give the impression of a unified design but of piecemeal construction. This is reinforced by the frequency of storage pits on the terraces and by levelled flats and low banks that sugggest house sites. This is particularly evident on the conspicuous series of terraces on the south-facing slopes immediately below the summit.

The highest sector of the crater rim may be assumed to have been the citadel or *tihi*, but it has suffered much alteration in recent years. The rectangular scarped platform, now covered by a paved concourse, presumably incorporates remains of original Maori work. This summit was defended on the east by two transverse and one diagonal scarp across the rising ground, extending from the end of the uppermost external terrace to the edge of the crater, below the Post Office building (Fig. 5). Two deep rectangular pits have been cut below the second transverse scarp, presumably at a later date. On the west the approach to the summit was guarded by the natural steep slopes created by a breach in the lip of the crater, just above the present road junction, and the upper terraces end here. Short lengths of the lower terraces continue across the breach on the lower side of the road. The interior of the crater was not terraced; traditionally this was a sacred place, the food bowl of Mataoho, the god of volcanoes.

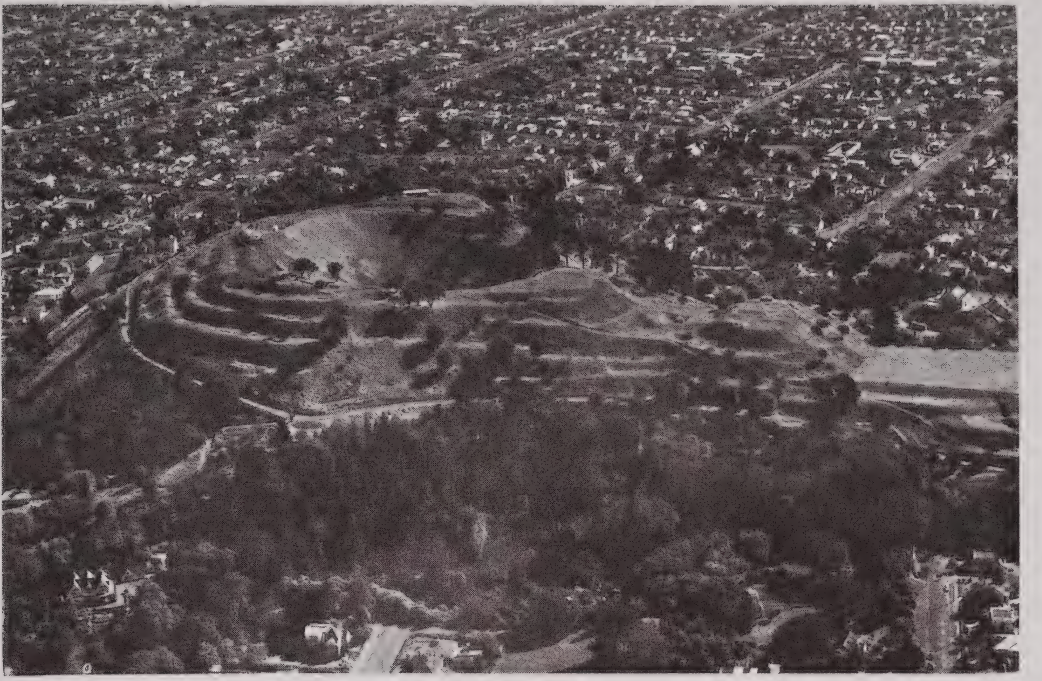

Fig. 4. Mount Eden (*Maungawhau*). Oblique air photograph from the east, showing the external terracing, crater and strong points. (Photo: Whites Aviation).

The summit was only the southern one of three or four strong points in this extensive pa (Fig. 5). A second one was constructed on the scoria mound on the opposite (northern) side of the crater, where the slopes down to the breach were defensively terraced; on the north side the steep sides of the mound sufficed but on the west a terraced scarp was inserted, which turns to cross the crater rim. The squarish summit of the knob, (38 x 30 m) was defined on two sides by a low bank that probably carried a palisade; a similar feature occurs in a subsidiary strong point on One Tree Hill (Fig. 11 — 5). The third strong point is a similar squarish flat topped mound 70 m to the north; it has been steepened artificially and there are traces of a fallen revetment of scoria blocks on the southern side. On the summit of the mound (Fig. 4) there are twelve pits in no set alignment which occupy almost all the level surface of 30 x 45 m, indicating that this was a main foodstore; there are also two very large deep pits on the saddle between the two strong points. Beyond this mound, the building of the reservoir has obliterated a considerable tract of the hill-top; formerly there was a shallow crater here (Fig. 3) and it seems likely that there was a fourth strong point on its rim incorporating the surviving steep scarp to the north. Below this, there are terraced slopes utilised for pit storage and house sites.

To sum up, the salient features of Mount Eden are:

(1) The creation of a series of strong points on the hillcrest, utilising the volcanic knobs of scoria. Their slopes were artificially steepened and the approaches defended either by terracing or by lines of scarping. One functioned as a communal food store.

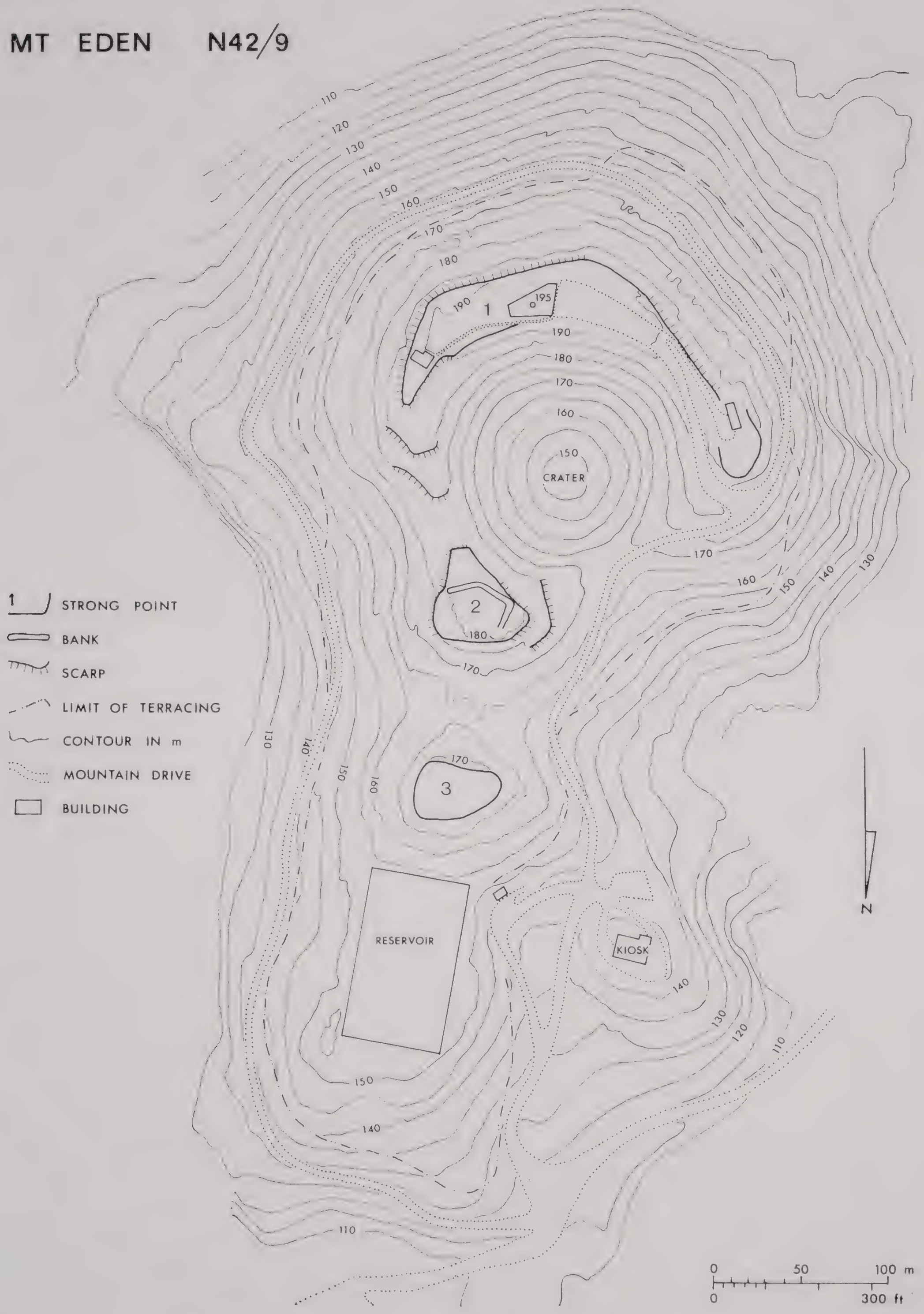

Fig. 5. Mount Eden *(Maungawhau)*. Diagram plan; based on contour survey and air photographs supplied by Mount Eden Borough Council, drawn by Caroline Phillips.

(2) The cutting of terraces on the external slopes, partly for defence but mainly for living places and pit storage. The terracing was not continuous around the entire perimeter.

(3) Defence by means of ditch and bank is absent.

These features recur in the majority of pa that are relatively undamaged on the Auckland volcanic hills. For example, Mount Roskill (Puketapapa) had three strong points on the rim of the double craters before the reservoir was built and Taylor's Hill (Taurere) had two. On Mangere Mountain the western summit constitutes the major strong point, being defended by two transverse scarps at the base and a bank near the top of the southern slopes. There are two other natural high points on the rim of the large crater, which though terraced for occupation, have not been modified for defence. Terracing on the external slopes is concentrated, in contrast to the rather sprawling settlement on the rim.

Whilst the number and formation of such strong points in each pa were obviously related to the accident of the throw-out from volcanic eruptions, the multiple use is a consistent feature, and may be regarded as a tribal characteristic. The early inhabitants of the Auckland Isthmus, according to evidence given to the Maori Land Courts in the 19th century, were the Waiohua tribe, a complex group comprising several related sub-tribes, including the Nga Iwi, Nga Oho and Nga Riki (Fenton 1879, p. 58).

PA WITH EARTHWORK DEFENCES

There is, however, a second variety of fortifications on the cones, in which transverse ditches, usually with an accompanying bank or scarp, form part of the defence. These consist of a central group of three, One Tree Hill, Mount St John and Mount Hobson, with two outliers, Mount Wellington on the Tamaki River and Motukorea, Brown's Island (Fig. 1); their relationship to the majority needs to be examined.

Mount Hobson (Fig. 6), named after Captain Hobson, R.N., the first governor of New Zealand and the founder of Auckland City, is a widely breached crater with the lava flow issuing from it in a southerly direction. The Maori settlement, named Remuera, formerly occupied the whole of the rim and slopes of the hemicycle, but the building of a reservoir has obliterated about a third of it; a quarry on the northern slopes has also cut into the site. The pa had only one strong point, the *tihi*, situated on the highest point, 470 ft (143 m) by the Trig station. It was defended on the south by the sweeping curves of three major terraces built in the interior of the crater, which follow the contours round the summit on the eastern slopes above Market Rd. amongst the modern houses and gardens, and re-emerge on the north-facing slopes above Remuera Rd., where short lengths of extra terraces have been interpolated.

The *tihi* was built on two levels above this main defensive terracing; access was probably by a path ascending the small scarps from the SE. Just north of the Trig, the hill top is crossed by a straight line of ditch with a 1 m high internal bank facing east, which plainly cuts through the scarps of the original *tihi*. A hundred metres farther along the ridge, beyond the wooded scar of the quarry, there is a second transverse ditch and bank, facing west; this has cut through a low stony bank

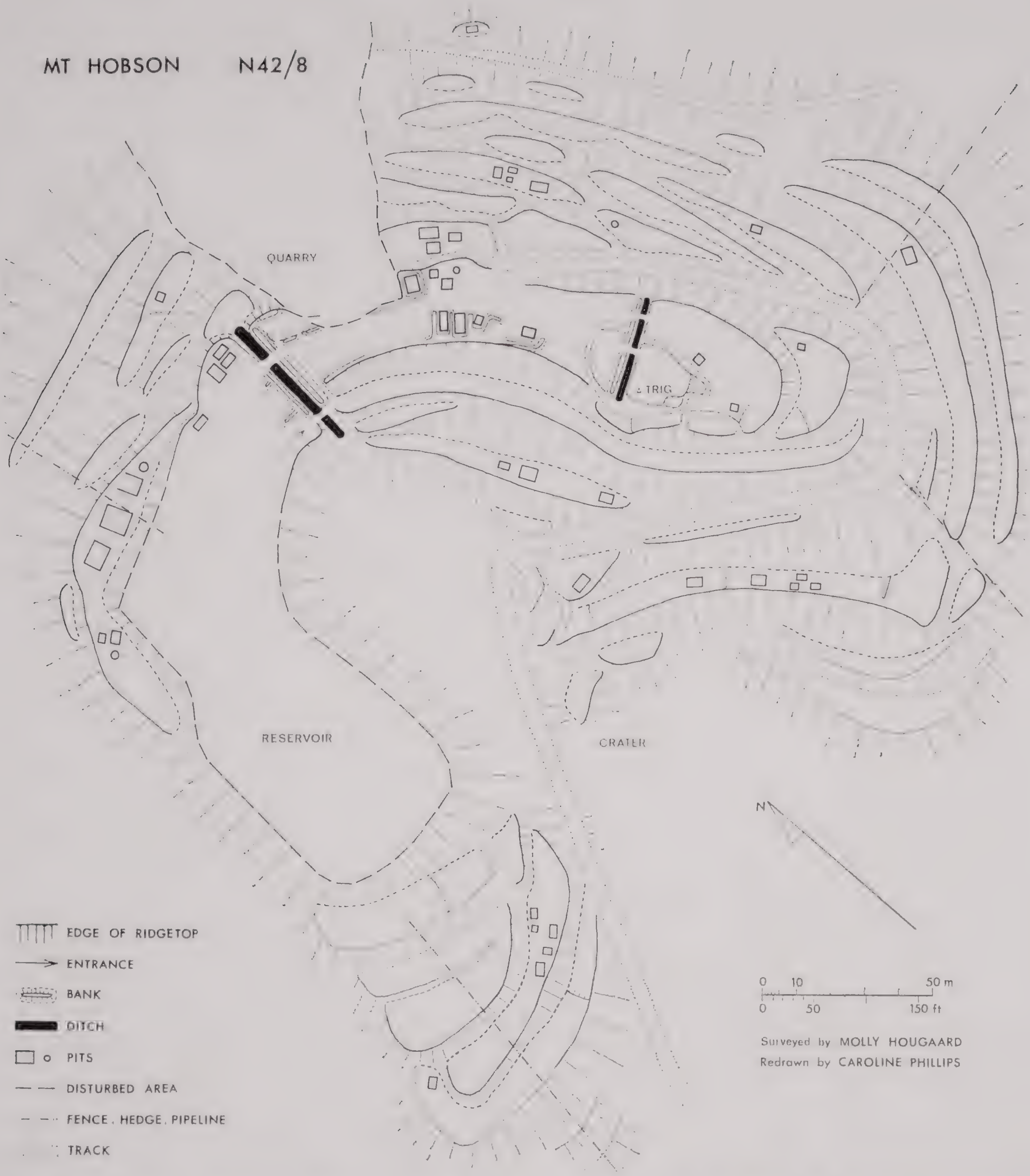

Fig. 6. Mount Hobson *(Remuera)* Plan; based on a survey by Mrs M. Hougaard and Auckland University Archaeological Society, redrawn by Caroline Phillips.

along the southern rim of the crater, which continues for 6 m beyond the ditch. It is clear that the citadel has been remodelled; the area has been reduced, surprisingly excluding the highest point, whilst the defences have been greatly strengthened by the additional earthworks. These guard against attack from either end of the ridge. A group of seven pits, mostly embanked, provided for food storage in the area between the defences.

The entrance to the citadel at this period was through the western defences, not by the central gap which is recent but by a path which crosses the end of the ditch at the edge of the crater and then continues up through a narrow gap round the southern end of the bank (Fig. 6). It is possible that there was a second way up on the northern side by one or other of two similar paths that lead up from a terraced flat behind the defensive bank, but these are very close to the side of the quarry and may not be original.

Analysis of the visible remains on Mt Hobson thus indicates that the ditches and banks belong to a late phase in the occupation. Is the same true of others in the group? On Mount St John (Te Kopuke) (Fig. 7) the settlement is built around the rim of a small horseshoe-shaped scoria cone, with intermittent terracing on the external

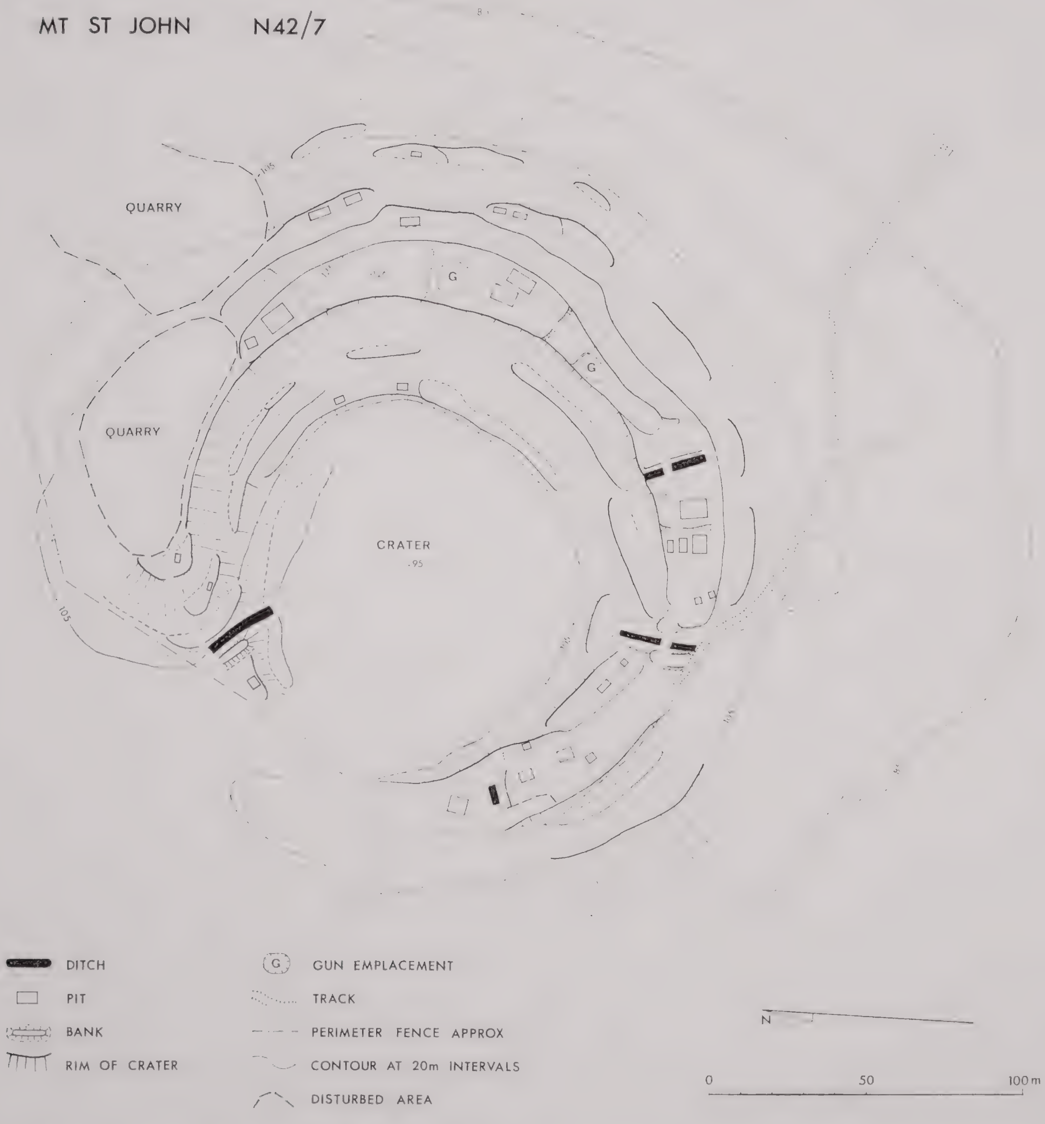

Fig. 7. Mount St John *(Te Kopuke)*. Plan; based on a survey by Anthropology Dept., Auckland University, drawn by Caroline Phillips.

slopes overlooking Market Rd, to the east. The flattened summit area (125 m) lacks a dominant strongpoint or *tihi;* it is divided by two low transverse banks and a scarp into three or four compartments, in two of which modern gun emplacements were installed during World War II. The Maori defence system was designed to defend the summit area from an attack starting in either direction from the lowest portion of the crater opposite. The northern flank is defended by three successive terraced scarps, with a transverse ditch and external bank below. The ditch continues across another terrace on the internal slopes of the crater and therefore should be a secondary feature. On the south and east there are three lines of transverse ditches and banks, spaced out on the terraced ascent, though breached by a modern track. The middle ditch has an external bank and like its opposite number, appears to interrupt terracing within the crater. Although the surface evidence is inconclusive, it is highly probable that the earthworks are additions to a terraced pa.

Mount Wellington (Maungarei) (Fig. 8) is a much more imposing fortification than either Mount Hobson or Mount St John, despite the building of a reservoir in 1960 within the northern part of the central triple crater. The lava flow was from a fissure on the flank of the cone in a southerly direction (Searle 1964, fig. 13); the lava field has been extensively quarried on the flat. The steep external slopes facing east towards the Tamaki river were terraced from top to bottom (150 m beyond the upper margin of the plan in Fig. 8). The terraces are intermittent, most have one or two storage pits visible on them, and their construction should relate to domestic needs rather than to defence. In addition there is a group of very large pits on the lower terraced slopes (not shown in Fig. 8) which suggest that the land between the pa and the river was heavily cultivated. A small stone walled garden was located in excavations in 1971 at the foot of the western slopes but the quarrying has removed all further traces of cultivation on this side of the mountain (Davidson 1975, p. 11). On the upper slopes and on the crater rim it is noticeable that the pits occur in groups of 5 to 11 pits arranged in an orderly fashion on the terraces; this implies some communal organisation of the food stores. Excavations of one such group of five on the crater rim NE of the reservoir, by Davidson in 1971-72, showed that some of the pits were lined with walls of neat scoria blocks; there was a cooking place nearby and a levelled flat where a few postholes and stakeholes were found. Excavations on two of the lower terrraces, cut by the new road later in 1972, revealed a succession of pits cut in the solid ground at the back of the terrace that had been filled in with midden. Part of a human burial was found on the second terrace, beside a large pit. There was no sign of palisade postholes at the edge of either terrace (Davidson pers. comm.).

The crater rim has two 'strong points', each defended by transverse ditches, and scarps. The southern one is on the highest point, 440 ft. (134 m) high, by the Trig, the other is on a rocky knob 376 ft. (115 m) high west of the reservoir (Fig. 8). The latter has an independent set of defences, designed like those on Mount St John (see above) to guard against an attack launched from the lowest point on the crater rim on the west, where a low bank has been thrown up on the outer edge. The transverse defences consist first of a bank, then of a scarp 40 m away on gently rising ground and each needing a palisade to be effective, and finally a ditch with an external bank at the foot of the major scarp. The ditch extends down the outer slopes where it can be clearly seen to cut through a terrace.

The ascent to the main *tihi* from the lowest point on the rim was difficult, for the ridge is steep and narrow with terraces on either side and the summit was

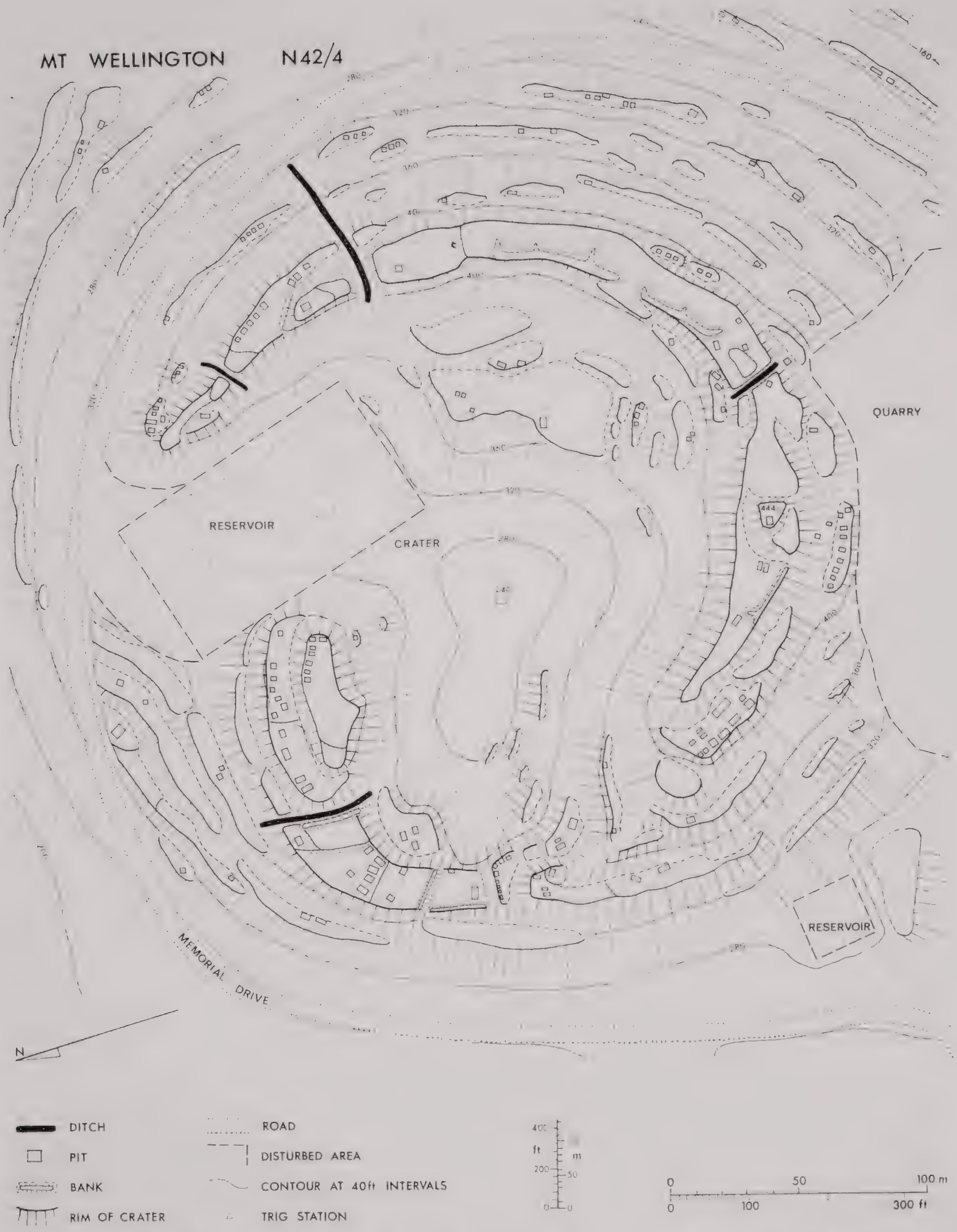

Fig. 8. Mount Wellington *(Maungerei)* Plan; based on a survey by Auckland University Archaeological Society and Mount Wellington Borough Council, redrawn by Caroline Phillips

barred by a succession of major scarps. Approached in the opposite direction, starting east of the reservoir, there are three transverse ditches to cross, widely spaced on the circumference of the crater. The second ditch appears to be the major obstacle; it has been dug for a considerable distance down the external slope, cutting through the uppermost terrace (Fig. 8) though the junction is unfortunately obscured by a track. The succeeding portion of the rim has been levelled and embanked on the inner edge to form a series of compartments. An excavation here by W. Shawcross in 1965 showed no signs of domestic use and it has been suggested that this was an open assembly place (Davidson 1975, p. 11). The final 10 m ascent to the summit is controlled by the third ditch which also appears to have cut through a terrace.

Thus it is probable that the ditches which defend both strong points on Mount Wellington were subsequent to the terracing: supplemented by palisades, they would have provided successive lines of resistance in the event of attack.

ONE TREE HILL

Finally, One Tree Hill (Maungakiekie) (Figs. 9-13) must be considered, the most magnificent structure of all the Auckland pa, daunting in its extent and complexity (Figs. 9, 10). The basic volcanic structure consists of a trio of craters, one a complete

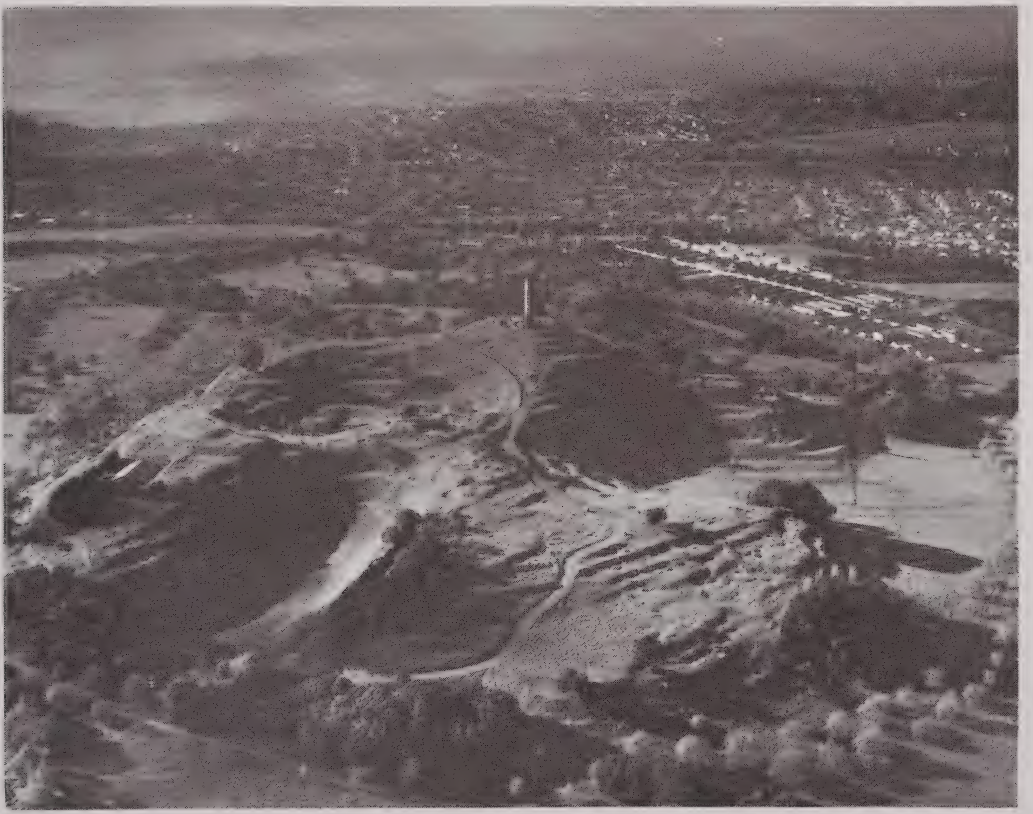

Fig. 9. One Tree Hill *(Maungakiekie)*. Oblique air photograph from the south-west showing the two lines of defences across the plateau in the illuminated foreground. (Photo: Whites Aviation).

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Fig. 10. One Tree Hill. Oblique air photograph from the south-east, showing the eastern crater and the terraced slopes to the summit. On the left the inner defences, on the right 'strong point' 5. (Photo: One Tree Hill Borough Council).

bowl, the other two breached to form the characteristic hemicycles or amphitheatres (Fig. 11). The resulting outline of the hill approximates to a trefoil, with two lobes on either side of the main crater and the third, a gently inclined plateau, extending south between the two breached craters. The external slopes are very steep and provide formidable natural defences; they rise from 120 m at the base to 150 m on the main crater rim, and to 180 m at the Monument on the summit. The only easing of the incline occurs at the lower southern end where a relatively easy ascent of 20 m to the plateau is possible either from the south-eastern flat, or by the modern Summit Drive (Fig. 9). The difference is well brought out by some experimental running by Pearce in 1974, which showed that it took only 13 seconds to sprint up from the flat to the plateau, whereas it took 125 seconds to run and scramble up the terraced slopes from the floor of the eastern crater to the summit, and the runner arrived in no fit condition to attack (Pearce 1977, p. 19, figs. 1, 2). It is thus apparent from the topography that the hill was vulnerable at the lower end, and that is where defences were needed. Furthermore, the southern lobe faces the easy lines of approach from the Manukau Harbour from which seaborne attacks could be expected.

The defences

Two defensive systems can be recognised on One Tree Hill (Fig. 11), first a comprehensive linear defence system related to the weakness in the topography, and

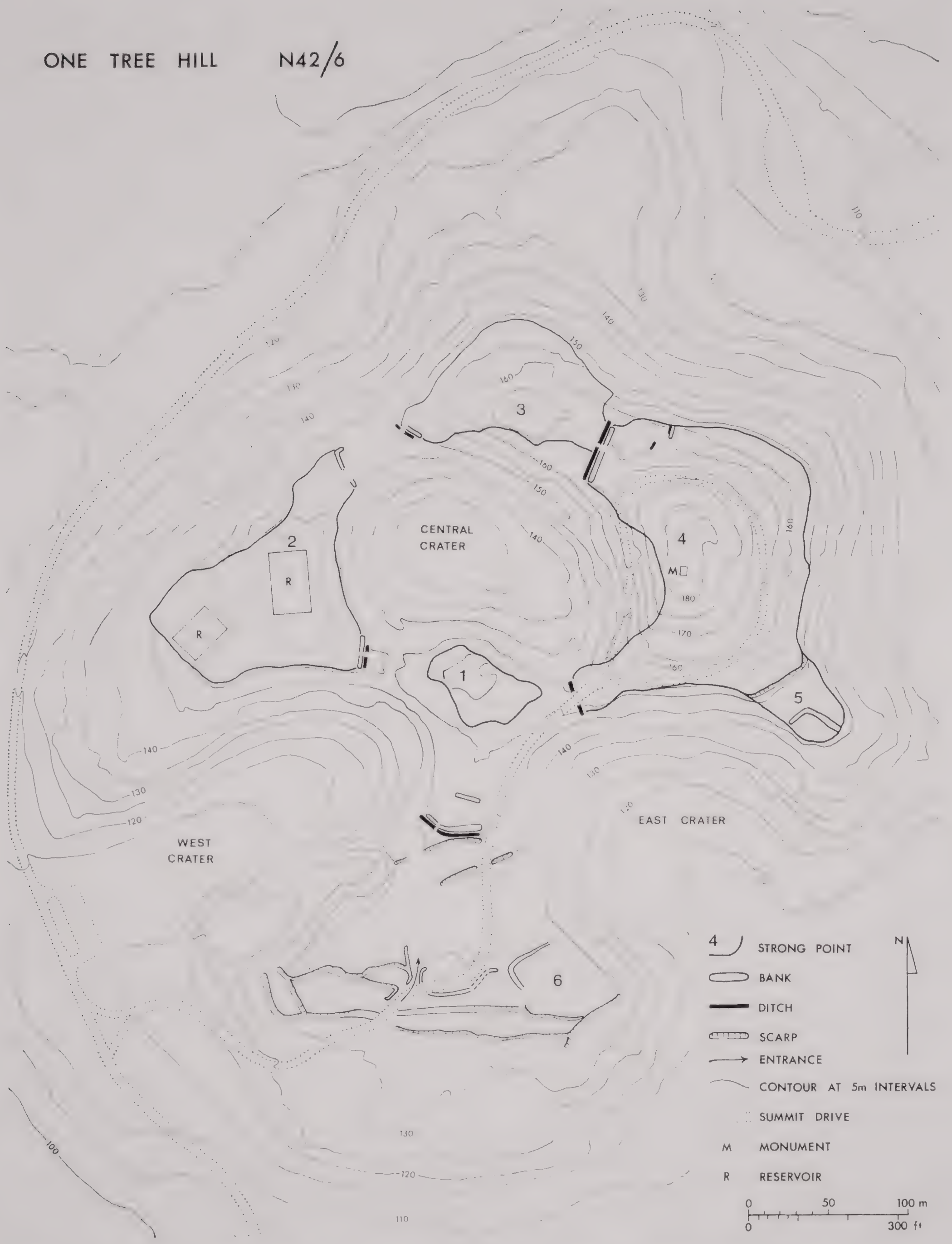

Fig. 11. One Tree Hill *(Maungakiekie).* Diagram plan showing the defences and strong points. Based on a contour map supplied by One Tree Hill Borough Council and surveys by Auckland University Anthropology Dept., drawn by Caroline Phillips.

secondly a system of semi-independent strong-points related to the natural strength of the volcanic features, as on Mt Eden or Mt Wellington.

The linear defence system consists of two lines, 300 m apart, a long outer line starting at the rim of the western crater and crossing the plateau diagonally in the direction of the eastern crater, and a short inner line across a rise on the narrow neck of land that separates the two craters. Both lines are multiple and consist chiefly of scarps supplemented by earth banks (Fig. 12). The earthworks in this area are very complicated and it seems unlikely that every feature can be understood, even after excavation. Much of the plateau was used as a golf course in the 1930s, and it is possible that some of the anomalous earthworks are the remains of tees, greens or bunkers. There was also a cart track which was used when the reservoirs were constructed and some subsidiary waterworks which have cut into the inner line of defences. Nevertheless the essential outline of the Maori defences is clear, as shown on the air photo (Fig. 9), the diagram plan (Fig. 11) and sections (Fig. 12).

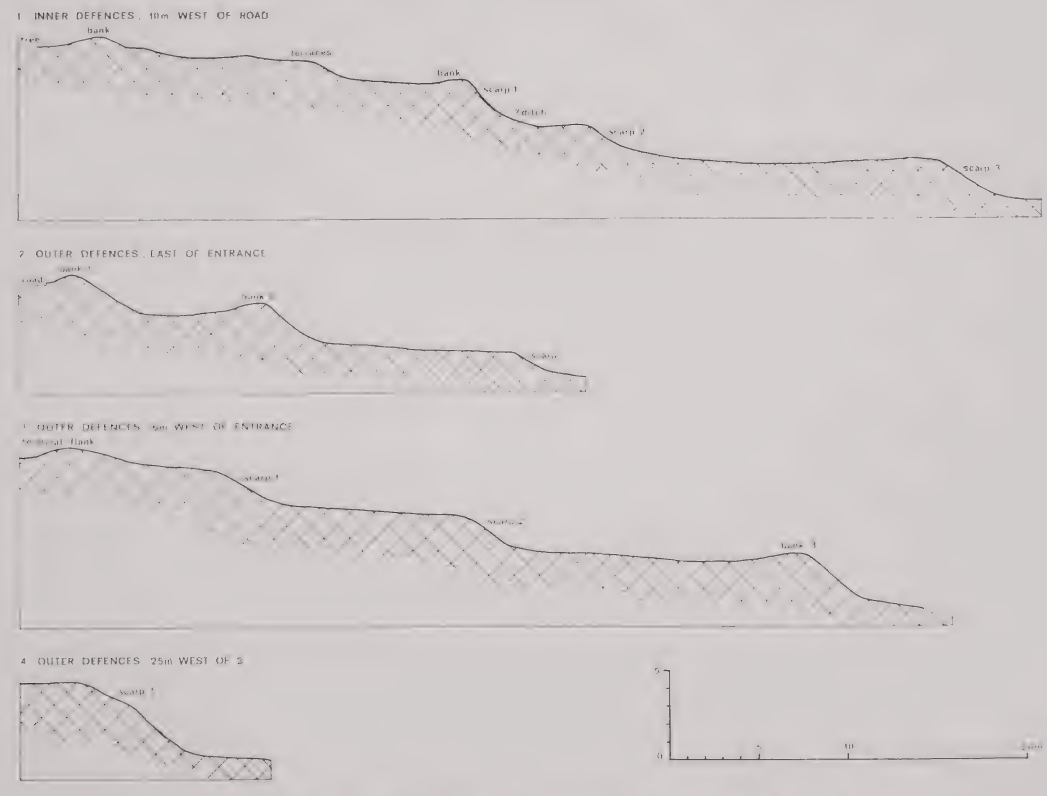
1 INNER DEFENCES, 10m WEST OF ROAD
tree
bank
terraces
bank
scarp 1
?ditch
scarp 2
scarp 3
2 OUTER DEFENCES, EAST OF ENTRANCE
road
bank 1
bank 2
scarp
3 OUTER DEFENCES 5m WEST OF ENTRANCE
flank
scarp 1
scarp 2
bank 3
4 OUTER DEFENCES 25m WEST OF 3
scarp 1
5
0
5
10

Fig. 12. One Tree Hill. Level-sections 1-4 across the defences.

Starting at the edge of the west crater, the outer line consists of a succession of formidable terraced scarps up the slope. The lowest projecting sector appears to be a replacement for a former direct line. As the slope eases on either side of the modern road, the scarp has been replaced by a bank, 1.5 m high and 3 m wide (Fig. 12 — section 3). The inner line commences by a mound, probably recent, and continues to a shallow projection, 19 m wide and 5 m high with a slope of 45° (Fig. 12 — section 4);

its commanding position suggests that it was designed to carry a fighting stage from which missiles could be hurled. At this point the earthwork bifurcates; each limb ends in low banks which form the sides of a narrow inturned entrance way, unfortunately partly cut away when the road was made, but undoubtedly an original feature (Fig. 11).

East of the road the two banks, supplemented by a third scarp (Fig. 12 — section 2) continue in a straight line across the plateau, diverging to end beside a rectangular embanked and terraced complex with 15 pits (Fig 11 — 6) beyond a group of puriri trees. It seems likely that this complex was in existence when the defences were constructed and that its south-facing scarp was incorporated in the new system. In contrast the third scarp continues as an effective outer defence as far as the steep slopes of the eastern crater. The defences have been breached in several places and minor scarps and pits have been inserted between the lines, presumably at a later date. There was no attempt to fortify the southern part of the plateau beyond these defences, unless it were by palisade, though there are many surface indications that the area was utilised at some time. The position was chosen in order to shorten the outer line and to avoid the weakness of a large salient in the event of an attack.

The second set of defences (Fig. 12 — section 1) across the narrow neck between the east and west craters (Fig. 11) seems to be a construction of several periods. The principal feature is a bank and ditch, which has been remodelled at the west end, where there is a change in the direction of the bank, which has been heightened by midden, and a deepening of the ditch. In front of these there is a scarp (Fig. 12 — section 1, scarp 2) but on a different alignment, close set on the east but diverging to end at the edge of the west crater, after an interruption by a cart track. Associated with it, is a short length of similar scarp 18 m farther forward which extends down across the first terrace on the side of the eastern crater, below the modern road (Fig. 12 — section 1, scarp 3); it is positioned to guard against flank attack from the south-east. These two scarps are probably the primary work; another transverse bank 20 m behind the main ditch and bank (beside a pine tree) may belong to this phase also.

The strong points

These two lines of complicated earthworks, the inner and the outer, complete the unified defences of One Tree Hill; they effectively bar the way from the plateau to the occupied zone surrounding the central crater and its terraced outer slopes. Within this zone four or five strong points can be recognised, each with its own scheme of defence. Moving clockwise round the main crater, the first or 'southern mount' (Fig. 11 — 1) now marked by a clump of karaka trees, is a rectangular knob defended only by major scarps; most of its flattened top was used for pit storage. The second or 'western mount' (Fig. 11 — 2) has been greatly modified by the building of two reservoirs. It was defended by a short length of bank and ditch starting at the edge of the western crater and continuing as terraced scarps around the rim of the central crater. The northern limit is indicated by a low transverse bank. The steep slopes facing north-west above the road have also been extensively terraced, and include a bastion-like projection just below the western reservoir, probably for a fighting platform or stage. The third strong point (Fig. 11 — 3), the 'northern mount' is separated from the western mount by a short length of transverse ditch with an internal bank continuing as a scarp along the side of the central crater; these defences cut through a terrace and so are a secondary construction.

The citadel proper (Fig. 13) was constructed on the adjoining steeply terraced summit of One Tree Hill; it was defended on the western side by a major earthwork,

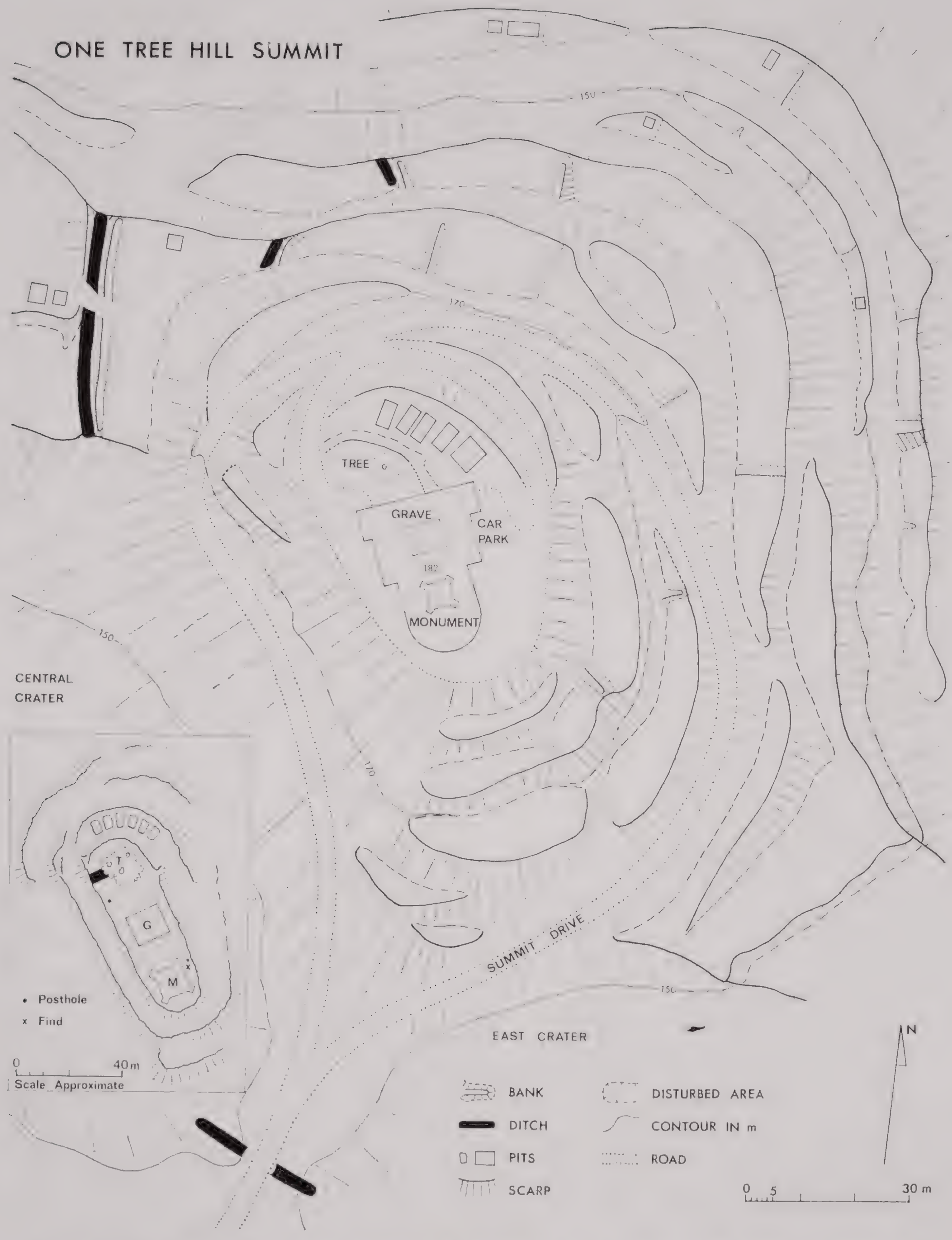

Fig. 13. One Tree Hill. Plan of summit. Redrawn by Caroline Phillips from a survey by Auckland University Anthropology Dept. Inset, after G. Fairfield 1941.

a transverse ditch with an internal bank across the crater rim, separating it from the flat of the 'northern mount'. Any attempt to outflank this line at the northern end was barred by two separate short lengths of ditch and bank; these also prevented access to the upper terraces where the principal living quarters were probably situated. On the eastern side the defence rested on a transverse ditch at the foot of the ascent, strategically placed on the narrow neck between two craters. Most of this earthwork, which was visible in photographs in 1940 (Fairfield 1941, fig. 17) is now covered by the Summit Drive. The inner side of the ditch was exposed by a slip within the east crater in 1976; a layer of shell midden (cockles) in the filling ended abruptly as though against a revetment post. The defended hill top has a succession of terraces on the east and north side; many of them are divided by a bank of undisturbed soil into compartments, which presumably relate to domestic requirements. Pits are absent, except for a row of five or six on a terrace immediately below the summit.

Below the citadel but high up on the rim of the eastern breached crater there is a small rectangular enclosure, which constitutes another strong point, the 'eastern mount' (Figs. 10, 11 — 5). It has a low bank on two sides, probably for a palisade, and contains five storage pits. The site is defensible with steep terraced slopes on both sides; it is separated from the citadel by a defensive scarp. A worn path winding up beside a scoria outcrop provided access to the strong point from the crater floor, where there are a series of low banks, indicative of cultivation (Fig. 10).

The summit and artifacts

The original surface of the hill top is now nearly completely obliterated by the monument dedicated to the Maori people and by the grave of Sir John Logan Campbell (1817-1912) to whose foresight, generosity and strong feeling for the past we owe the preservation of these great earthworks. This would have been a most important area, the *tihi* or summit platform pertaining to the chief. It is known that there was a sacred totara tree growing here in the 18th century which provided an alternative name for the place, *Totara i ahua. (*Smith 1897, p. 81). When the ground was levelled in 1940 for the construction of the monument and the paved surround, the end of a small-scale transverse ditch and two deep postholes were seen and recorded by Fairfield (1941, p. 94) (Fig. 13 — inset). The position of the postholes on the edge of the scarp suggests that these were part of a palisade around the hill top. The ditch, which cuts across the summit, is not well placed for defence; it is possible that it defined a *tapu* area related to the sacred tree.

Two remarkable little objects carved out of scoria (Figs. 14-16) were recovered at the same time with other artifacts and subsequently deposited in Auckland Museum. One is an anthropomorphic figure, three dimensional, with a round head, emphatic features, raised arms and stubby legs and toes (Fig. 14). The front of the torso is patterned with a double spiral design. The flat back has a central rectangular cavity, which could be used as a container only if the image were held horizontally, probably suspended by a cord round the neck and feet (Fig. 15). It can be deduced that the figure was intended to be seen from below, like the well known 'feather boxes' (*waka huia)* which are carved on the underside. The second container is undecorated (Fig. 16); it has an oval slot cut into the flat surface, and a central groove around the sides and base probably also for suspension. Both objects were of a size suitable for holding tattooing pigments, such as can be seen in Augustus Earle's painting of a Maori being tattooed (Murray-Oliver 1968 pl. 28). They indicate that an important activity connected with the warrior class, namely *moko* or tattooing, may have been carried out on the summit platform.

[redacted]

14

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For cultural reasons, these images have been removed.
Please contact Auckland Museum for more information.

15

Figs. 14, 15. Scoria artifact from One Tree Hill. 14. Anthropomorphic figure 10.5 cm high. 15. The same suspended to show back with rectangular cavity. (Photos: Vahry Photography).

For cultural reasons, this image has been removed.
Please contact Auckland Museum for more information.

Fig. 16. Scoria artifact from One Tree Hill. Container, 10 cm long. (Photo: Vahry Photography).

Summary

A field survey of One Tree Hill, therefore, has shown that this immense and complex site incorporates defensive features recognised in other Auckland *pa,* namely the terraced slopes, the strong points which include pit stores, the transverse ditches, banks and defensive scarps. In part the irregularities in relief produced by the volcanic throw-out of scoria have determined the multiple strongpoint construction as already noted at Mt Eden (see above, p. 5) but it may reflect a tendency to separatism in the social organisation of the Waiohua tribes. The same phenomenon occurs on Pouerua and Maungaturoto pa on the volcanic cones near Ohaeawai in the Bay of Islands (Best 1927, figs. 77, 78). On the other hand, although each centre has its separate defence, the ditches face in one direction, as though to forestall attack in a clockwise direction around the rim of the central crater, towards the citadel. The steepness of the terraced external slopes, precluded attacks launched from the bottom of the hill, as Pearce's experiments have shown (see above, p. 13). It appears that the use of ditches on One Tree Hill, as elsewhere in Auckland, is a late feature. The single ditch incorporated in the linear defences (see above, p. 16 and Fig. 11) is an addition to primary scarps, and the ditch defending the 'northern mount' cuts into a terrace. Apart from the major earthwork defending the citadel, the use of ditches is uncertain, being limited to short lengths of small-scale excavations; the defenders presumably relied on palisades.

GENERAL DISCUSSION

It now remains to fit the results of this survey of the Auckland pa into the chronological framework provided by archaeology, based on the evidence of radiocarbon dating, and to supplement it by what is known of the local Maori history, based on oral tradition; this was ultimately written down as evidence in support of claims to the Maori Land Courts before Mr Justice Fenton in 1868 and recorded by John White, Percy Smith and others in the late 19th century.

The earliest radio-carbon dates on the Auckland isthmus have been obtained by Sullivan from a small open settlement among the extensive cultivations on the lower slopes of the volcanic pa on Wiri Mountain, Manurewa. These range from a.d. 1220 ± 200 from occupation layers predating a terrace, to deposits of a.d. 1490 and 1560 ± 90 which were associated with occupation on the terrace (Sullivan 1975, p. 206). It is therefore highly probable that there was similar open settlement in central Auckland, beginning in the 12th or 13th century. It is certain that by the 15th century there was settlement on Mount Wellington, because a radiocarbon date of a.d. 1430 ± 40 (corrected to a.d. 1440, Law pers. comm.) was obtained by Golson in excavations, when the reservoir was being constructed (Golson 1961, p. 51). This was from a midden deposit which pre-dated the construction of a terrace with pits (Golson 1960, p. 33). It is evident from this and other salvage excavations that occupation on the cones was prolonged: on both Mount Roskill (W. Shawcross, 1962, p. 82) and Mount Wellington, a sequence of intercutting pits has been uncovered, whilst in 1974-5 on Elle't's Mountain, McKinlay had evidence of three periods of occupation, from which material for radiocarbon dating was obtained but the results are not yet available. The close-packed terraces anad the numerous pits on the hills spreading down the slopes far beyond the defences as on One Tree Hill or Mount Wellington also imply a steady growth in population over a long period of time, or else a period of rapid expansion.

There is, as yet, no archaeological evidence for the date of any of the earthwork fortifications. This can only come from skilled excavations designed to obtain the requisite material for radiocarbon analysis from stratified deposits; for example, charcoal from a hearth sealed below a bank, which must pre-date the construction, or rotted fragments of wood in the postholes of timber palisades. At present we must rely on the field survey, which has shown that the earthwork defences are a late feature of the four pa.

We must therefore turn to the traditional historic sources in search of an appropriate context for the fortification of a small proportion of the Auckland pa. From the evidence given to Mr Justice Fenton in 1868 in the Native Land Courts concerning land at Orakei, it is apparent that during the first half of the 18th century the Waiohua people came under attack from the neighbouring confederacies of the Ngati Paoa to the south, centred on the west coast of Thames, and the Ngati Whatua to the north, centred in South Kaipara. An extensive raid by the Ngati Paoa to Kohimarama and Orakei about A.D. 1700 was not followed up by annexation of any of the Waitemata coast, though settlement took place on Waiheke and other off-shore islands, as well as farther north (Fenton 1879, p. 61, 62). A generation or two later, *circa* A.D. 1740, the Waiohua had an outstanding leader, Kiwi Tamaki with his principal seat on One Tree Hill and his territory extending over the whole isthmus (Smith 1897, p. 79). He treacherously killed several members of the Te Taou, a sub-tribe of the Ngati Whatua and in consequence the Ngati

Whatua came south from Kaipara to take revenge *(utu)*. A combination of attacks by land and sea were ultimately successful and the Waiohua led by Kiwi were defeated at Paruroa (Big Muddy Creek) on the shores of the Manukau; One Tree Hill and Mangere were both taken during this time. These events provide a possible background for the fortification on One Tree Hill. The elaborate outer lines of defence are unique in the Auckland pa, and as already pointed out (see above, p. 13) were designed against an attack from the direction of the Manukau. It is tempting to see them as the work of the great Kiwi Tamaki, but they could be of earlier date since there are signs of alterations and additions (see above, p. 16). The remodelling of the second line of defence which included the heightening of the bank with midden, and the short lengths of small-scale ditches added to the strong points (see above, p. 20) however may represent a hasty attempt to strengthen the position against the expected Ngati Whatua attack. After the victory, it is recorded that Te Taou remained to occupy "the desolated and vacant countryside and held undisputed possession of all the lands inhabited by the numerous tribe of the Waiohua" (Fenton 1879, p. 64). Judge Fenton was told by a claimant that their chief Tuperiri had built his pa on One Tree Hill, adding that he had seen the palisade posts still standing in his own time. The competent and complete earthwork defences of the One Tree Hill summit (Fig. 13) set it apart from the other 'strong points' in the pa and suggest that this self-contained citadel is the work of a newcomer, well accustomed to this type of earthwork fortifications. Defence by means of a transverse ditch and bank is common to most areas in the North Island and is certainly found in the territory of Ngati Whatua in South Kaipara.

Similarly on Mount Hobson there is evidence of a changed style of fortification where the defences of a small new citadel have been imposed on a terraced *tihi* of the Waiohua type (see above, p. 8). Mount St John, which lies between the two, completes the picture of a replacement of culture in this central area. If all three sites are contemporary, they give the impression of a small number of newcomers who were uneasy in a strange land and resorted to a strong defence. Other pa mentioned as belonging to Te Taou are small-scale works on the upper Waitemata, including the headland pa on Kauri Point and Tauhinu, Greenhithe (Fenton 1879, p. 65). This phase of tension did not last long; in the early 19th century as Sullivan (pers. comm.) has shown, Te Taou had abandoned their defensive position on One Tree Hill and were living close to the harbour on the flat land at Onehunga and Mangere. In 1840 when John Logan Campbell climbed through high fern to the top of Mount Hobson, it was to admire the view from Remuera, not the pa site, which must have been completely overgrown (Campbell 1881, p. 109).

The fortifications on Mount Wellington require another context. The situation of Maungarei on the Tamaki estuary made it vulnerable to seaborne attack by tribes from the Hauraki Gulf, the Ngati Maru and Ngati Paoa. It is therefore probable that the Waiohua had occasion to fortify against the Ngati Paoa intrusion led by Chief Kapetawa in the early 18th century (Fenton 1879, p. 61) or at some earlier period for which information is lacking. There is also the possibility that some of the earthworks were constructed by Ngati Paoa people after the Waiohua had been overcome by Te Taou. It is recorded that a coastal strip on the west bank of the river known as Tauoma was given in the late 18th century to a member of the Ngati Paoa by Te Taou; shortly after there was a period of strife in which both tribes were involved, and when a re-fortification at Maungarei might have been required (Fenton 1879, pp. 66, 67). The ditch systems on Mount Wellington, which have been demonstrated to be an addition to the terraced pa of the Waiohua, divide the crater rim into zones suitable for successive lines of defence, in a similar manner to the ditches on the headland pa on Pawhetau Point, in Ngati Paoa territory further south (Fox 1974, p. 16, fig 4). On the Tamaki the main centre for this branch of the Ngati Paoa people in the early 19th century was at Mokoia, beside the Panmure Basin, with another fortification, Mauinaina, at Panmure itself (Fenton 1879, p. 68). In 1820 when Samuel Marsden visited Mt Wellington from Mokoia (Mogoea), it was apparent that the hill was uninhabited (Elder 1932, pp. 280, 314).

Epilogue

The Auckland isthmus has had a troubled prehistory; it was not known as *Tamaki-makau-rau* without good cause (Tamaki with a hundred lovers, i.e. desired of many). There were doubtless other occasions in the more remote past when some intruder needed to fortify a site for which oral tradition is lacking, or when the validity of the surviving stories needs careful assessment by Maori scholars. The interpretation that has been put forward in this article is admittedly speculative, though based on a detailed archaeological analysis and on a standard printed source, in which the witnesses were recounting events of only two or three generations before (Fenton 1879, p. 64). It is recognised that the chronology that has been suggested can be contradicted or modified by the results of excavations in the near future. Although this attempt to correlate archaeological and historic evidence may be premature, it is hoped that it has demonstrated the contribution that field archaeology can make to the understanding of Auckland's prehistory.

Acknowledgements. This work could never have been accomplished without the assistance of archaeology students at Auckland University who, under the direction of Molly Nicholls (now Mrs Hougaard) in 1964 and of Roger Green in 1974-77 made large scale plans of Mount Hobson, One Tree Hill and Mount St. John, on which figs 6, 7, 11 and 13 have been based, after revision in the field. Contour plans and air photos were kindly made available by One Tree Hill Domain Board through Mr. J. Howse, and by Mount Eden Borough Council, through the engineer, Mr. E. Briggs. Dr. Aidan Challis assisted with the level sections on One Tree Hill. I am very grateful to them all, as well as to my draughtswoman Caroline Phillips for her sensitive and patient work.

For information about the excavations on Mount Wellington I am indebted to Janet Davidson, Auckland Institute and Museum, and for those on Mount Roskill to Wilfred Shawcross. Mrs. Agnes Sullivan kindly read the text and made some historical emendations; any remaining errors are my responsibility.

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SALVAGE EXCAVATION OF AN ARCHAIC BURIAL CONTEXT, N44/97, HAHEI

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Abstract. Following the recent discovery of an archaic burial with grave gifts and seemingly associated working-floor at Hahei Beach, a small rescue excavation was conducted at N44/97. The extant stratigraphy and artifactual material from the site are described and compared to similar working-floors exposed *in situ* on neighbouring allotments.

In December 1975, the elements of an unusually rich archaic burial were discovered together with an equally early occupation floor on the property of Mr. and Mrs. B. Phillips at 19 Wigmore Road, Hahei, on the Coromandel Peninsula.

The finds comprised human remains (a cranial fragment, three vertebrae and several phalanges), two necklaces made of Sperm whale-ivory (a total of twenty-one reel units and two whale-tooth pendants), a *Carcharodon* shark-tooth pendant, a fragment of an unfinished, one-piece fish-hook, three siliceous drill points, a sandstone file fragment and a dog's tooth (see Figs. 36-48) — all within an area of 2-3 m^2.

Distributed over a wider area of approximately 150 m^2, other objects, derived from the occupation floor, comprised several fragments of an unidentified moa species, a shaft fragment of *Dinornis* sp. and the bones of seal and fish. Also collected were a number of obsidian flakes (grey and green), Tahanga basalt and siliceous flakes, an argillite flake and burnt haangi stones.

Details of site N44/97 were reported by Mr. J. D. Osborne of Howick and Mr. and Mrs. B. Phillips kindly presented the finds to the Auckland Institute and Museum. The site was inspected by Lady Fox, acting E. E. Vaile Archaeologist, upon whose recommendation it was decided to conduct, with the approval of the Archaeology Committee, Historic Places Trust, a small rescue excavation on behalf of the Museum.

SITE LOCATION AND HISTORY

Situated on the east coast of Coromandel (Fig. 1 — inset), between Cook's Beach and Hot Water Beach, Hahei shares the general physiographic characteristics of the peninsula's exposed ocean beaches. Typical are the long, sweeping, sandy beach between high headlands, extensive dune sands several metres a.s.l., streams at both ends of the beach, low-lying, formerly swampy hinterland and light, loamy soils on the valley floor margins. Immediately offshore, there are two small islands and several islets.

From the viewpoint of subsistence economics, such locations with their pronounced microenvironmental diversity and variety of food resources available within a short

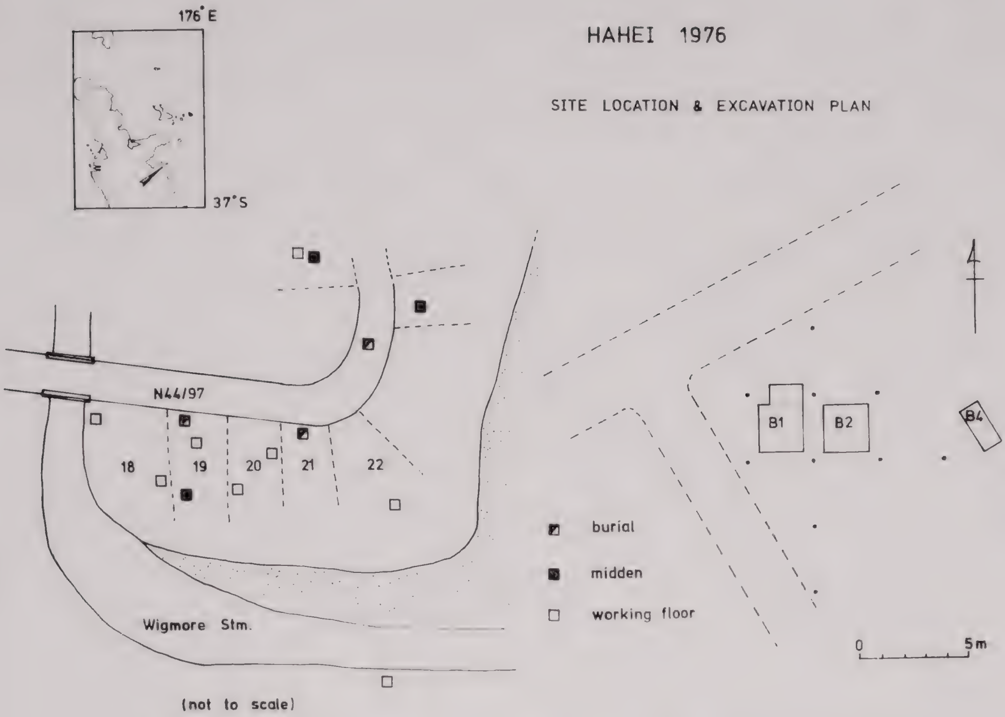


Fig. 1. Plan showing the location of N44/97 and neighbouring sites

compass are highly favourable for settlement. Indeed, the distribution of early Archaic sites on Coromandel's East Coast is a direct expression of a marked preference for the exploitation of such areas.

Arawa and Ngatihei tradition, together with historical sources, would ascribe a lengthy (if somewhat turbulent) period of occupation to Hahei. The assemblage of late artifacts, provenanced to a midden on the headland pa, N44/7, and assigned to the Classic Period by Green (1963, p. 67) together with Moore's survey of the field evidence (Moore 1976a, p. 147) point to the area's significance late in Prehistory. Until recently, there has been little evidence recorded for the area's early exploration and primary settlement. Some idea of time-depth for the latter is provided by the fairly high incidence of archaic adzes in the Harsant Collection and Moore's observations on the dominance of Tahanga Basalt in the lithology of localised adzes (Moore 1976b, p. 83).

N44/97 is located at the southern end of Hahei Beach on consolidated dunes between the sea and the Wigmore Stream. The former lies some 200 m to the east and the stream some 50 m to the west and south (Fig. 1). It is one of several sites to have been recently revealed as the result of coastal subdivision and service road construction for holiday homes — a process which was initiated in 1963.

When the Wigmore Road was first constructed, in 1970, two burials (both unrecorded) were exposed. The first was found beneath a 2 m-deep overburden of sand some 60 m north-east of N44/97 and the other on the roadside verge of Lot 21 some

30 m east of the latest burial. Both of the 1970 burials were re-interred. Restructuring of the road in 1975 resulted in the exposure of the burial belonging to N44/97.

EXCAVATION

Excavation took place between April 26-30, 1976. The immediate objective was to recover and record the extant stratigraphic context of the burial with its grave gifts. A grid was established at the roadside front of Mr. Phillips' property, Lot 19 Wigmore Road, with pegs A - E along the N/S axis and pegs 1 - 4 on the E/W axis at 3 m intervals. Three squares (B1, B2 and B4) were excavated providing a total excavated area of 11.5 m^2 (Fig. 1). Lots 20 and 18 were also examined.

STRATIGRAPHY OF B1

The stratigraphy of B1 was established as follows (Fig. 2).

Layer I — Topsoil of yellow clay and humus substituted by light-grey, wind-blown sand in the northern half of the square.

Layer II — Loose, grey sand containing decaying vegetable matter (lupin, inkweed and fern roots, lupin seeds etc.) and the shells of several species of dune-dwelling land snails. Lower horizon more compacted than upper.

Layer III — Light, yellow-brown sand (compacted when wet) with discontinuous, charcoal lenses.

Natural — Clean, yellow sand.

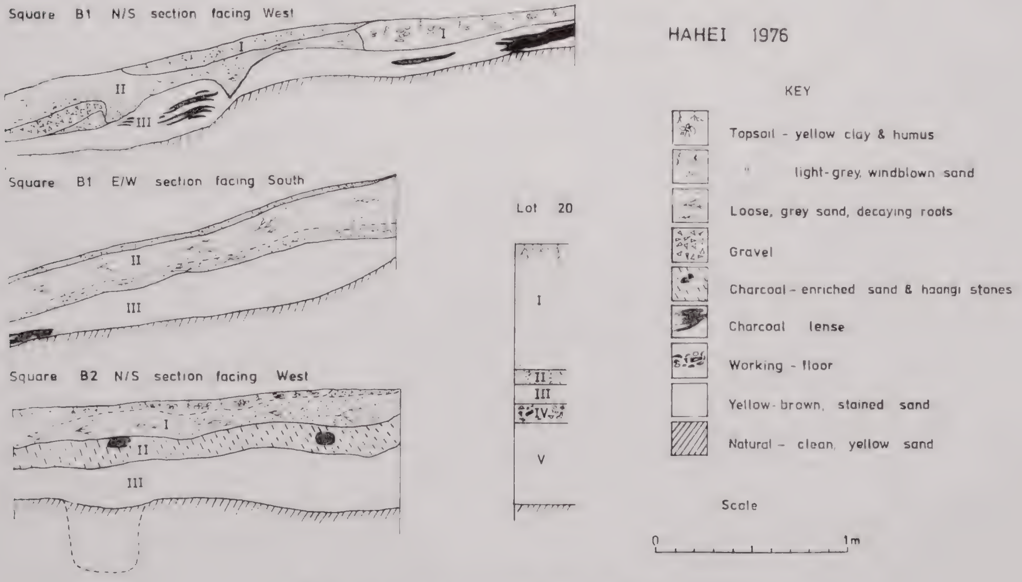

Square B1 N/S section facing West
I
II
III
Square B1 E/W section facing South
II
III
Square B2 N/S section facing West
I
II
III
Lot 20
I
II
III
IV
V
HAHEI 1976
KEY
Topsoil - yellow clay & humus
" light-grey, windblown sand
Loose, grey sand, decaying roots
Gravel
Charcoal - enriched sand & haangi stones
Charcoal lense
Working - floor
Yellow-brown, stained sand
Natural - clean, yellow sand
Scale
0
1m

Fig. 2. Principal cross-sections, N44/97.

Layers I and II, while rich in artifacts (Table 1), were demonstrably recent. They post-dated a gravel spread of either builder's mix or roading metal located in B1's northern extension. However, a human phalange and carpal fragment recovered from Layer II are almost certainly derived from the burial. Only Layer III remained partially intact. It appeared to be the basal stratum of an occupation floor upon which cooking and workshop activities (manufacture of adzes, drill points and working of bone and wood) were performed. No structural features were in evidence.

Table 1. Numerical distribution of artifacts by category and layer.

Distribution	Surface Lot 19 1975	B1	B2	B4	L18	B1	B4	L20	B1	B2	B2	L18
								[		undisturbed		]
Layer		I	I	I	I	II	II	IV	III	II	III	II
Argillite flake	1											
,, ,, pol.		1										
Andesite fragment			2						2			
Basalt flakes	X	21	27	5		7	27	45	21	48	4	
,, ,, pol.						1		1			1	
Basalt roughouts			2			2				3		
Siliceous core			1				1	1		1		
,, flakes	X	5				2	14	10	4	12	4	
.. drill points	3						1	2	1	1		
Greywacke flakes										2		
,, ,, pol.	X							1				
Obsidian core	X										1	
.. flakes green	X	2	4	1	1	3	7	1	2	15		
.. ,, grey	X	2	6	3		1	8	1	3	10		
Sandstone files	1						1			1		1
,, hoanga		1					X		X			
Smoothing pebbles		X	X	X		X	X	X	X	X	X	
Pumice pebbles (wkd)			X			X		X				
Haangi stones	X	X	X				X		X			
Fish-hook tab	1				1							
Other worked bone	1	1						1		1		

(X = present)

It became apparent that the burial, with its grave gifts lying *in situ*, was derived from a context above present ground level, i.e. from the 1 m-high mound which was bulldozed to the southern end of Lot 19 in order to level the section and backfill the retaining walls at the front and to the west of Mr. Phillips' house. Further surface finds of a human vertebra and two rib fragments, besides the diffuse scatter of cultural material between the road front and the house, accord with this explanation.

In the hope that a more substantial part of the occupation floor could be recovered reasonably intact from the higher ground east of B1, a second square was excavated.

STRATIGRAPHY OF B2

Layer I — (upper horizon) — Topsoil as for Square B1 Layer I.

Layer I — (lower horizon) — Loose, grey sand with matted roots similar to B1 Layer II.

Layer II — Grey-black, charcoal-enriched sand, occasional lumps of charcoal and shattered haangi stones.

Layer III — Yellow-brown, stained sand merging into natural, yellow sand. Compacted when wet.

Layer I, again fairly rich in cultural material, was recent. Layer II, essentially a charcoal silhouette in keeping with the remains of an oven area exposed to weathering, was found to be intact. Vertical streaks of charcoal-stained sand were probably the result of rain-water percolating through from the surface. Layer III was distinguished by its stained yellow-brown upper horizon (? percolating water again) for some 10-25 cm, within which the occasional stone flake was found, before merging into natural, yellow sand. A circular depression, the significance of which is not clear, had been cut into the natural. Containing a clean, white, sandy fill, it did not extend eastwards quite as far as the section but its position is indicated in Fig. 2.

A third, small square was excavated further to the east as a final check on the area.

STRATIGRAPHY OF B4

Layer I — Topsoil as for B1 and B2 Layer I.
Layer II — Mixed, yellow-brown sand.
Layer III — Dark, charcoal-stained sand and decomposing roots of dune vegetation.
Natural — Clean, yellow sand.

The fact that matted roots from clearly recent vegetation were found at different levels throughout Layer III (i.e. to a depth of 70 cm below present ground level) indicated that B4 had encountered the lip of a recently back-filled depression which is still extant on Lot 20 to the east.

At the conclusion of the excavation, Lots 20 and 18 (respectively east and west of N44/97) were examined. Of particular importance was the 2.80 m long, newly-exposed section on the eastern side of the driveway to Lot 20 (along the common boundary with Lot 21) for we believe it provides the key to understanding the extant stratigraphy of N44/97 (Fig. 2).

STRATIGRAPHY OF LOT 20

Layer I	— Dune-sand with vegetation on surface,	depth of 65 cm
Layer II	— Darker sand,	depth of 7 cm
Layer III	— Light, sterile sand,	depth of 10 cm
Layer IV	— Working-floor,	depth of 10 cm
Layer V	— Stained, yellow-brown sand,	depth of 42 cm
Natural	— Clean, yellow sand	Total depth of 1.34 m

Artifacts from the working-floor (Layer IV) included numerous basalt and siliceous flakes, two flakes from polished basalt and greywacke adzes, two chert drill points, a few obsidian flakes and sandstone pebbles — material identical to that obtained from the excavation of N44/97 (Table 1).

Immediately west of the boundary shared by Lots 18 and 19, a drill point, the core of a fish-hook tab and several fragments of bone, including moa (species unidentified), were found on the surface beneath immature dune vegetation.

STRATIGRAPHY OF LOT 18

Layer I	— Loose, grey, wind-blown sand,	depth of 5 cm
Layer II	— Stained, yellow-brown sand,	depth of 65 cm
Natural	— Clean, yellow sand.	

A sandstone file fragment was recovered from Layer II.

DISCUSSION

On the basis of the evidence provided by both the excavation of N44/97 and examination of the adjacent allotments 18 and 20, it is clear that, in the process of levelling Lot 19, the burial context and associated working-floor were almost completely destroyed. The mixed yellow-brown or stained sand, which occurs consistently throughout the area (B1 Layer III, B2 Layers II and III (upper horizon), Lot 18 Layer II, Lot 20 Layer V and possibly B4 Layer III) is the basal stratum of a spatially substantial occupation-floor. Of no great stratigraphic depth, the site's extant remains are confined to the boundary of Lots 20 and 21 (it may well continue into the latter) and close to the boundary of Lots 19 and 20 immediately west and north of the 3,000 gallon water-tank. It is impossible to determine whether the site formerly extended to the working-floors noted near the Wigmore Bridge and on Lot 22, or how it relates to N44/93 on the southern bank of the stream at this stage. Artifacts from these three working-floors do, however, closely resemble those of N44/97 both in form and material.

A wide range of industrial activities may be inferred from the artifactual evidence (Figs. 3-35). These include the fashioning and re-working of adzes (mostly of Tahanga Basalt), the manufacture of drill points (from massive cores of hard siliceous material) and one-piece fish-hooks, and other objects of bone and wood.

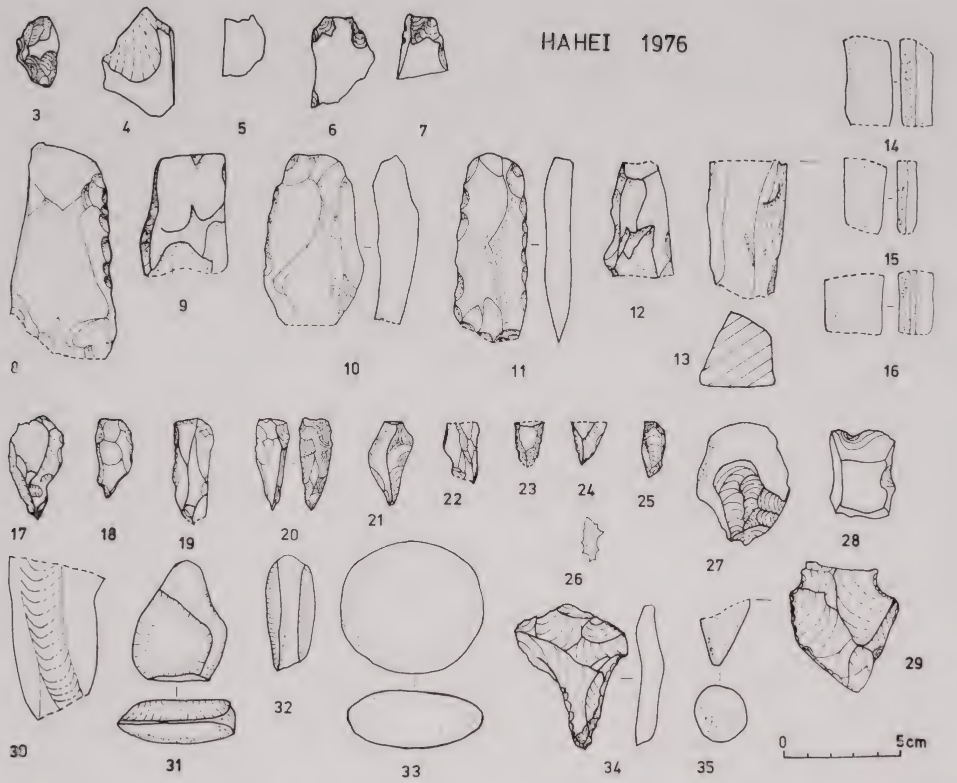
Insufficient midden material was recovered from N44/97 to enable a statement on the occupants' diet and economy (Table 2). In view of the site's recent history, this is not surprising. A small re-deposited shell midden, composed mainly of pipi and tuatua in a charcoal-enriched matrix, was noted at the southern end of Lot 19 but its derivation is unknown.

Two samples of charcoal-enriched sand (B2 Layers II and III interface, and B1 Layer III) have been submitted to the D.S.I.R., Lower Hutt for C^{14} determination.

THE GRAVE GIFTS (Figs. 36-48)

The two pendants and 21 reel units made of Sperm whale-ivory were recovered *in situ* within an area some 50 cm square. They are greatly desiccated and in an extremely fragile condition.

The smaller of the two whale-tooth pendants (Fig. 37) which is 9.8 cm in length, features a 2 mm-deep scarf around the margin towards the distal end of the tooth. It is not clear whether this represents a provision for suspension, a stage in levelling the wall prior to drilling holes for suspension (Duff 1956, p. 107) or simply ornamentation. Neither the large pendant (Fig. 36) which is 11.8 cm in length, nor the smaller, bear evidence for perforation across the wall of the root but this may be due to their poor state of preservation. Both specimens are derived from an immature Sperm whale, perhaps up to ten metres in length (A. B. Stephenson, pers. comm.).

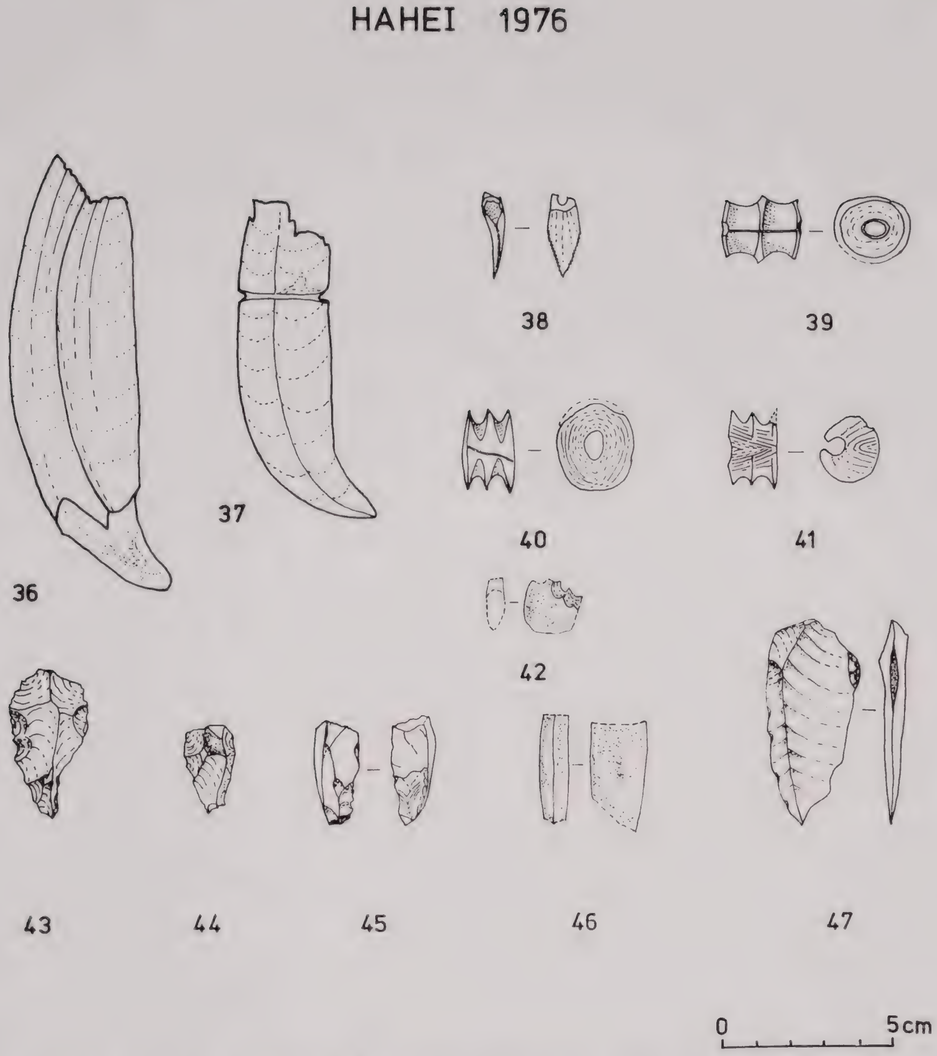


Figs. 3-35. Artifacts recovered from the excavation of N44/97. 3. Flake from polished, black argillite adze, AR 5987. 4-7. Flakes from polished, Tahanga basalt adzes, AR 6020, 6031, & 6055. 8-13. Adze roughouts of Tahanga basalt, AR 6017, 6065, 6019 & 6065. 14-16. Sandstone file fragments, AR 6045, 6023 & 6053. 17-25. Siliceous drill points, AR 6065, 6025, 6062, 6060, 6043, 6001 & 6065, 26. Core of moa-bone fish-hook tab, AR 6052. 27-29. Obsidian core tools, AR 6018, 6024 & 6063. 30. Sandstone hoanga, AR 6065. 31-33. Smoothing stones, AR 6028, 5991 & 6040. 34. Awl of Tahanga basalt, AR 6065. 35. Worked pumice cone, AR 6065.

Table 2. Distribution of faunal remains by species and layer.

Distribution	Surface Lot 19 1975	B1	B2	B4	L18	B1	B4	L20	B1	B2	B2	L18
								[		undisturbed		]
Layer		I	I	I	I	II	II	IV	III	II	III	II
Moa crop-stones							2					
Moa (*Dinornis sp.*)	X					X		X	?		?	
Bird (unidentified)						X	X	X		X		
Dog	X				X							
Seal	X								?			
Human	X					X	X		?			
Fish (unidentified)	X								X	X		
Pipi			?					X			?	
Tuatua							2					
Neothais									1	X		
Other gastropods									X			

(X = present)



Figs. 36-47. Surface collection of artifacts (1975) from N44/97. 36-37. Sperm whale-tooth pendants, E47408 & E47417. 38. *Carcharodon* shark-tooth pendant, E47406. 39. Sperm whale-ivory reel Style A, E47409. 40-41. Sperm whale-ivory reels Style B, E47414. 42. Fragment of one-piece fish-hook tab, E47415. 43-45. Siliceous drill points, E47412-3 & E47410. 46. Sandstone file fragment, E47411. 47. Obsidian blade tool, E47418.

The necklaces are composed of ivory reels or beads (an attractive light brown due to discoloration) which have been cut from the short, solid section near the crown of the Sperm whale's tooth. Two distinctive styles are recognisable (see Fig. 48).

Style A is represented by eleven elongated or barrel-shaped units (Fig. 39). These vary in length 19-23 mm and in diameter 15-22 mm at their median flanges. They display remarkable uniformity in both their external proportions and the dimensions of their centrally-drilled perforations (5.5-8 mm). It is by no means clear how reels such as these were manufactured, particularly in their final stages of completion. The precision with which many reels have been made, however, strongly suggests employ-

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Fig. 48. The Sperm whale-tooth pendants and ivory-reel necklaces recovered from the surface of N44/97, Hahei Beach, Coromandel. (Photo: Vahry Photography).

ment of a lathing principle. Several reels feature longitudinal fissures, but it is believed that these are the result ofnatural shrinkage through oil loss. The eleven units give a combined dry weight of 46.8 g and, placed end to end, a combined length of 24 cm.

Style B is represented by the shorter necklace comprising ten units (Figs. 40-41). These reels are characterised by pronounced transverse flanges set close together to produce a closed concertina-like effect. Varying in length 13-16 mm and in diameter 21-26 mm at their lateral margins, they possess larger and more irregular perforations (5-14 mm) for suspension. It is of some interest that the smallest reel (Fig. 41) is one of an assumed pair cut from the same section of solid ivory. In so far as it is possible to tell, its "twin" is not employed in this particular necklace. Some of the reels display fissures similar to the Style A examples. The ten units give a combined dry weight of 52.8 g and, placed end to end, a combined length of 13.5 cm.

Dr. Duff's study of the morphology, material of manufacture and distribution of provenanced reels and pendants (1956, Ch. 4) remains a standard text on the subject of archaic ornament typology. Discussion here is confined to observations on the general significance of the three traits which best characterise the Hahei finds. These are the rarity of their numerical occurrence (as opposed to spatial distribution), stylistic affinities with the Wairau Bar grave gifts and the association of whale-ivory reels with Sperm whale-tooth pendants.

Five complete whale-ivory necklaces have been recorded previously from three locations; Mercury Bay (Skinner 1934, p. 106), Wairau Bar burials 1, 32 and 34 (Duff 1956) and the Chathams (Skinner 1943, p. 132). Finds of single whale-ivory reels, occasionally derived from burials (e.g. Wairau Bar burial 3), but more commonly from midden contexts, have been recorded at Opito Bay, Porangahau, Porirua, Wairau Bar, Patiti Point, Waitaki River-mouth, Long Point, Papatowai and the Chathams. The distribution of whale-ivory reels is clearly widespread, but this is not to say that they are common. Indeed, they are known from only some 20-25% of those localities where reels in other media (ivory other than whale, bone, stone and shell) are recorded (Duff 1956, pp. 135-36). Only at Wairau Bar, where whale-ivory reels comprise 43% of the 121 units of ivory, bone, stone and shell, can they be said to occur with a high frequency.

The precise relationships between stylistic conservatism in archaic ornaments and their technology and materials of manufacture have yet to be documented in time and space. In this regard, the Hahei finds are of considerable interest. While the ivory-reel necklaces (10 units) from Mercury Bay (Duff 1956, pl. 18A) and Wairau Bar burial 1 (7 units) share a close morphological affinity (Duff 1956, p. 93), the Hahei Style A reels share a close affinity with the moa-bone reels (11 units) from Wairau Bar burial 2 (Duff 1956, p. 90), and the Hahei Style B reels share a close affinity with the ? human-bone reels (13 units) from Wairau Bar burial 16 (Duff 1956, pl. 10B). Of equal interest is the fact that only Wairau Bar burials 1 and 2 contained Sperm whale-teeth (Duff 1956, pl. 8A & 9A) — the obvious prototype for a range of pendants rendered in bone and stone — perforated for suspension.

It is difficult to regard the close morphological affinities and their associations between the Hahei and Wairau Bar necklaces as a chance occurrence. Meantime, tempting as it may be to argue for a temporal link between these two sites, widely-separated in space, we shall await, with some interest, the results of our samples' C^{14} determination.

The single, serrated shark-tooth ornament (Fig. 42) is of interest, for it may well have been worn as an ear-pendant rather than as part of a necklace. It is made from one of the few, waisted teeth found in the central upper-jaw of a mature *Carcharodon* or White Pointer shark. The highly-enamelled tooth, 24 mm in length, features a single, dorsally-drilled hole 3 mm in diameter. The lateral root margins have been worked so as to produce a smooth, angled plane on either side, a practice normally associated with close-fitting necklace units (Duff 1956, p. 130).

Complete *Carcharodon* shark-teeth necklaces have been recovered from burial contexts at Goodwood Beach, Karitane, Wairau Bar (Duff 1956, p. 130) and the

Chathams (Simmons 1962, p. 238). Finds of single teeth and, more rarely, incomplete necklaces have been recovered from middens at Opito (Skinner & Phillips 1953, pp. 172, 185), Horowhenua (Adkin 1948, p. 61), ? Centre Island in the Foveaux Straits (Edge-Partington 1969, pp. 181, 222) besides Wairau Bar and the Chathams. Shell copies of these necklace units, dated to the 13th-14th century A.D., are recorded by Golson (1959, p. 45) from his excavation at Opito Bay. Fossil *Carcharodon* shark-tooth ornaments are also recorded for the Chathams (Nevill 1955, p. 492).

CONCLUSION

The importance of the Hahei finds lies not so much in the rarity of their recorded occurrence, as in their certain association with the well-documented Coromandel aspect of Archaic material culture.

The overburden of recent dune sands, immediately west of Hahei Beach, undoubtedly preserves further valuable evidence for the area's intermittent occupation by the Maori at the earlier end of the New Zealand prehistoric sequence.

This evidence could be destroyed by ribbon development in the near future, particularly at the southern end of Hahei Beach where, within the last few years, six recorded and five un-recorded sites (including two burials) have been seriously disturbed or lost.

Acknowledgements. We wish to thank Mr. and Mrs. J. D. Osborne for their valued interest and generous hospitality; Mr. and Mrs. B. Phillips for permitting us to excavate on their property; the Auckland Institute and Museum for meeting the costs of excavation; Lady Aileen Fox for her encouragement and comment on our initial report; Mr. D. Simmons, Auckland Institute and Museum, for permitting us to publish the grave gifts; Mrs. P. Bond, Mr. K. Sprengers and Vahry Photography for reductions and photographs of the illustrations, and Mrs. Ilana Edson for typing this report.

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NEW AND INTERESTING RECORDS OF ADVENTIVE PLANTS FROM THE AUCKLAND INSTITUTE AND MUSEUM HERBARIUM 3

E. B. BANGERTER

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Abstract: Further information on the distribution and history of adventive plant species in New Zealand is provided in this third list of records from the Auckland Institute and Museum Herbarium (AK).

This third account of some adventive plants is based as before (Bangerter 1975, 1976) on recently acquired or re-identified material. Attention has been given particularly to species represented by only one or two gatherings as these suggest either rarity or lack of collecting; only when distribution is of interest are third collections recorded, as in the case of *Geranium purpureum*. The necessary research into literature following the re-identification of early material in the herbaria of eminent botanists such as Cheeseman and Kirk often reveals interesting historical information as in the cases of *Bupleurum lancifolium* and *Centaurea melitensis*.

The nomenclature adopted is that published by the New Zealand Weed and Pest Control Society (1969). For species not included in that work references are given to the publications consulted. Specimens are cited by collector's numbers or, in the absence of these, by the AK Herbarium number.

CRASSULACEAE

Crassula decumbens Thunb.

Auckland, Puriri Drive, Cornwall Park, 1971, A. E. Esler and S. J. Astridge, AK 129869; Franklin, near Tuakau, 1973, A. E. Orchard 4001; Hokianga, Waipoua State Forest, Kawerua, 1976, A. E. Wright 1399. These three relatively recent collections (which all have carpels with more than six seeds) together with one early specimen collected by H. B. Matthews, AK 69138, from Kaitaia, cited by Carse (1916), constitute the total representation of this species in the Herbarium. Healy (1948) redetermines Cheeseman's Penrose record, represented by sheet AK 69137, as *C. macrantha* (Hook. f.) Diels & Pritzel. An indication that *C. decumbens* was being recorded during the intervening period is provided by Healy (1944), who gives several localities, but absence of material in the Herbarium during this period may be due to the lowly habit of the plant, which must be carefully searched for.

GERANIACEAE

Geranium purpureum Vill.

Auckland, Newmarket, George Street, 1976, E. B. Bangerter 5319. This is the third gathering in the Herbarium of this species, which is probably more widespread than currently recognised owing to possible confusion with *G. robertianum*. Its prevalence in the Auckland area beyond this record and the two previously given by Bangerter (1975) is revealed by Healy (1957) where two collections made by H. Carse in 1929, one from Penrose and the other from Onehunga, are cited.

PAPILIONACEAE

Lathyrus tingitanus L.

The following specimens, all previously named *L. latifolius* L., were re-determined by Miss J. H. Goulding in 1972 as *L. tingitanus:* Parnell, Cathedral Place, 1945, B. Molesworth, AK 33772; Wellington Heads, 1950, K. Wood, AK 26587; Waitemata Co., Matakatia, 1965, J. H. Goulding 71; Hokianga Co., Kohukohu, 1966, R. C. Cooper, AK 117741, 117742; Bay of Islands, Opito Bay, 1966, R. C. Cooper, AK 127066. Allan (1940) says of this species "Noted as an escape near Blenheim," whilst Healy (1958, 1959) gives further localities in both Islands. The Herbarium also has a gathering: Parnell, Cathedral Place, 1975, E. G. Turbott, AK 138188, made thirty years after that of Miss Molesworth from the same locality.

Lathyrus latifolius L.

Other than cultivated material only three sheets of this species remain in the Herbarium after removal of the specimens re-determined as *L. tingitanus:* Mairangi Bay, in short grass near beach, 1974, E. B. Bangerter 5232; Waikumete Cemetery, 1976, E. B. Bangerter 5285, (collected in company with Miss S. Bowman and Mrs K. Wood); Waitemata Co., roadside near Bethells Beach, 1977, A. E. Wright 1661. Early records of this species may be found in Armstrong (1872), Kirk (1899) and Cheeseman (1906). Thomson (1922) and Allan (1940) provide no further localities and Healy (1969) gives it only a rare and local distribution in Canterbury. A photograph is provided by Parham & Healy (1976) who state that it may be found on "roadsides, hedges, waste land."

BUXACEAE

Buxus sempervirens L.

Gt. Mercury Island, Huruhi Harbour, 1975, A. E. Wright, AK 137058. Except for two garden specimens this is the only gathering of box in the Herbarium. Allan (1940), in his Appendix, merely says "an occasional escape"; Connor (1951) gives it the same status and remarks that "the careless disposal of box-hedge clippings affords the common method of box poisoning in stock." Healy (1969) whose use of the name is followed here, gives the only recorded locality I can find, listing the plant as local and rare in the Canterbury area.

SALICACEAE

Populus alba L. var. *nivea* Ait.

Mairangi Bay, on bank of creek, 1976, E. B. Bangerter 5311; Bethells Beach, mouth of Waitakere River, 1977, A. E. Wright 1690. These are the only examples of the silver poplar in the Herbarium. Allan (1940) says that "it suckers freely and tends to form colonies." My specimen was gathered from a stand of some half-dozen trees, some up to 6 m tall, growing with *Albizia lophantha, Cyathea dealbata* and *Coprosma* sp. The variety is distinguished from *P. alba,* the white poplar, by having all leaves white beneath. Hilgendorf (1967) and Healy (1969) both state that it may be classed as a noxious weed.

Salix caprea L.

Mairangi Bay, Montrose Terrace, 1973, E. B. Bangerter 5120. Little recording of this willow seems to have been done since Cheeseman (1925), who says ahat it was "occasionally seen" with *S. fragilis* L. and *S. babylonica* L. Allan (1940) remarks "established . . . in several localities", but does not specify any. Healy (1969) gives it in his Canterbury list and Allo (1959) states that its removal from swamp country in the Bay of Plenty area was "one of the biggest single tasks". A specimen labelled *S. babylonica* from Tauranga Co., Ngawaro, 1965, R. C. Cooper, AK 125748 is not a weeping willow but answers to the description of *S. caprea*, "pussy willow", and provides the only other gathering in the Herbarium. It has female catkins whereas my specimen bears male.

UMBELLIFERAE

Bupleurum lancifolium Hornem.

Healy (1969), in his list of plants adventive in the Canterbury area, indicates a first record for this species, as a casual and local introduction, giving its origin as an impurity in bird-seed. A specimen mis-identified as *B. rotundifolium* L., Auckland Domain, T. F. Cheeseman, AK 33245, constitutes the sole representation in the Herbarium of *B. lancifolium*, but is unfortunately not dated. Cheeseman (1906) gives "near Auckland" as a locality for *B. rotundifolium*, revealing a possible very early date: he does not list *B. lancifolium* at all. The oblong-lanceolate leaves, sub-orbicular bracteoles and fewer rays distinguish the latter from the former. I have not been able to trace any other records for *B. lancifolium*.

Melanoselinum decipiens (Schrader & Wendl.) Hoffm.

Other than cultivated material, the Herbarium possesses two gatherings of this species: Devonport, North Head, 1971, K. Wood, AK 128675, det. A. E. Esler; Mairangi Bay, roadside bank with *Daucus carota*, fl. 1976, fr. 1977, E. B. Bangerter 5326. This handsome umbellifer has distinct dark purple fruits, the lateral wings of which are strongly denticulate; they are thin and flattened, being easily wind-borne as noted by Healy (1973). When being collected the plant has an aroma reminiscent of cultivated angelica, and I find that it is referred to by Constance (1967) in his note on *Angelica* cultivated in New Zealand. The nomenclature follows Tutin (1968: 371), where a detailed description may be found.

LOGANIACEAE

Buddleia davidii Franch.

Auckland, Mt Wellington lava fields, 1973, A. E. Wright 556. This is the only New Zealand example of this species in the Herbarium. It was first recorded by Healy (1946), who gives several localities, and is listed by him for Canterbury (Healy 1969), but I have not found any other author who has paid attention to it. The species was a ready coloniser of London bombed-sites after the last war.

COMPOSITAE

Anthemis arvensis L.

Thomson (1922) gives the first record of this species as "by Kirk in 1869 in the Auckland district." The only gathering in the Herbarium is: Penrose, T. Kirk, AK

78199 as *Matricaria arvensis,* with a pencil note on the sheet "New Record? p. 156." The page number refers to Allan (1940), where the record published by Kirk (1870) is noted. Cheeseman (1906) says of this and the allied species *A. cotula* L. "not common". More recent authors describe the plant as widespread and occasional, which makes the absence of material, other than Kirk's potential voucher for the first record, somewhat surprising. *A. cotula,* of which species there are several gatherings, has linear, acute receptacular scales, whereas those of *A. arvensis* are lanceolate, cuspidate. Most of the mayweeds *(Anthemis* spp. and *Matricaria* spp.) bear a superficial resemblance to each other and *A. arvensis* may have been passed over in the field for one of the more common species. Modern treatment of the group places species in several genera but New Zealand records are to be found under one or other of the two genera mentioned above.

Aster laevis L.

Mairangi Bay, 1974, E. B. Bangerter 5155. The identification of this plant is tentative as Michaelmas daisies are a complex group. It is put on record as the only named material in the Herbarium. I am unable to trace any other records for this species which is listed by the New Zealand Weed and Pest Control Society (1969) and by Matthews (1975).

Centaurea melitensis L.

Five undated sheets: Devonport, T. F. Cheeseman, AK 89791-5, erroneously identified as *C. solstitialis* L., represent this species in the Herbarium. Thomson (1922) says that Kirk reported the species from Canterbury in 1895 but "it has not been recorded since." Allan (1940) does add further localities as does Matthews (1975), and Healy (1944) gives several stations in the South Island. The last author (Healy 1969), describes it as an occasional species in sheep camps. It has not, therefore, disappeared from the adventive flora in spite of non-recording between 1895 and 1922. The misidentification of Cheeseman's specimens no doubt explains lack of reference to the Devonport locality.

Centaurea solstitialis L.

This species has been recorded from New Zealand since Hooker (1864) but only one sheet, AK 89800, exists in the Herbarium and that one of doubtful origin. On a Herb. T. F. Cheeseman label is written in pencil "vicinity of Wellington" and below "T.F.C.??". On the sheet itself, also in pencil, is written "Cent. soli.?, vic. Wellington, T. Kirk ??". The reason for suggesting Kirk as collector is presumably because he lists the species in his paper (Kirk 1878) on the naturalised plants of Port Nicholson. Healy (1969) in his account of the adventive flora in Canterbury states that the species appeared with lucerne stands sown with seeds of French origin.

Erigeron canadensis L.

Mangonui, Whale Island, 1976, A. E. Wright 1164. This is the only recent addition to the few gatherings in the Herbarium, undated but made by early collectors such as Cheeseman and Carse. The gathering, Mairangi Bay, 1973, E. B. Bangerter 5017, was wrongly determined by me as *E. canadensis* and was later re-determined by A. J. Healy as *E. floribundus* (H. B. K.) Sch-Bip. Consequent revision of herbarium material resulted in some forty sheets under the former name being transferred to the latter, with the exception of a few re-identified as *E. bonariensis* L. The differences between *E. floribundus* and *E. bonariensis* are detailed by Healy (1957), *Erigeron pusillus* Nutt.

Kaitaia, 1924, H. B. Matthews, AK 90426-30, comprises five sheets put under *Erigeron* but not determined specifically. This ample and uniform collection answers to the description of *E. pusillus* as given by Allan (1940) and compares well with American material named *Conyza canadensis* var. *pusilla* (Nutt.) Crong. I have, however, in this case followed the nomenclature used by the New Zealand Weed and Pest Control Society (1969). The only other reference to this species that I have noted is in Matthews (1975), where it is said not to be widely distributed.

SOLANACEAE

Solanum diflorum Vell.

Auckland, Mt Wellington Domain, under trees in wasteland on site of old quarry, 1974, A. E. Esler & S. J. Astridge 4682. This is the only example in the Herbarium. Healy (1958) publishes the first records of this species, under its older synonym, *S. capsicastrum* Link., from Upper Hutt and near Feilding in 1953. Later (Healy 1969), he lists the species for Canterbury.

AMARYLLIDACEAE

Allium neapolitanum Cyr.

Auckland, Mt Roskill, Parau Street, rare on a roadside bank with *Oxalis* spp. and *Allium triquetrum* L., 1976, A. E. Orchard 4857. This is a third gathering in the Herbarium of this plant noted as an escape for the first time by Bangerter (1976).

Acknowledgements. Once again I am grateful to Dr A. E. Orchard and Miss J. H. Goulding, Auckland Institute and Museum, for continued assistance in assembling these records. I am also indebted to Mr A. E. Wright, of the University of Auckland, for co-operation in acquiring most welcome adventive material.

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EARLY PUBLICATIONS AND EXHIBITS OF NEW ZEALAND FERNS AND THE WORK OF ERIC CRAIG

JEANNE H. GOULDING

AUCKLAND INSTITUTE AND MUSEUM

Abstract. Reference is made to the first publications on New Zealand ferns and to national and international exhibits of dried ferns followed by an account of the work of Eric Craig (1829-1923), fern collector and mounter of Princes Street, Auckland.

In England, the popular interest in ferns was at its height in the 1850s (Allen 1969); professional plant collectors marketed sets of pressed British ferns, and fern albums graced the occasional tables of Early Victorian drawing rooms. As with many fashions, the craze for ferns came much later to New Zealand than to the British Isles. Although the first publications on New Zealand ferns (Hooker 1855) appeared in 1855, and classified collections of dried ferns were exhibited as early as 1865, it was not until the 1870s that New Zealand fern albums, notably those produced commercially by Eric Craig, came into their own.

Early fern publications 1855-1890.

From the time of Banks and Solander (botanists with Captain Cook in 1769), plant collectors who visited New Zealand at once remarked on the abundance of ferns and the many new species. Amateur and student botanists in New Zealand were first provided with detailed descriptions of the fern species when Sir Joseph Hooker's *Flora Novae-Zelandiae* was published in 1855 (Hooker 1855). In this, accurate scientific names were available for fern collectors. Next, in 1861, came a booklet of 32 pages by Mrs Jones, wife of Commissary-General Jones of Auckland (Jones 1861). This little handbook of ferns was printed by John Varty, Queen Street, Auckland — "Price Two Shillings and Sixpence. Proceeds to be devoted to the fund for defraying expenses incurred in the erection of St Mary's Church, Parnell." Mrs Jones aimed to supply amateurs with the means of identification and systematic arrangement of their dried fern specimens — "whilst the collection and preservation of these beautiful plants has become a popular amusement few can name or classify their specimens" (Jones 1861, p. 3). Scientific terms were kept to a minimum and only short botanical descriptions were given. The little booklet was claimed a creditable "first attempt to popularise the study of the N.Z. ferns" (Field 1890, p. 3). Another popular treatise, priced at two shillings, with simple though detailed descriptions by H.E.S.L. (Leech or Logan?) was printed in Auckland in 1875 (L., H.E.S. 1875). In 1880 came the books of blueprint illustrations by Herbert B. Dobbie — first in two parts then a second issue of the two parts together in one book (Dobbie 1880 a, b, c). A similar collection of illustrations, published by Eric Craig and advertised as his "celebrated Blue Book" (see Fig. 6), appeared about 1888 (Craig *ca.* 1888).

Rec. Auckland Inst. Mus. 14: 63-79 10 December 1977

The ferns and fern allies of New Zealand "with instructions for their collection and hints on their cultivation" by George M. Thomson of Dunedin was published in 1882 (Thomson 1882). Thomson's book, of 132 pages and 5 plates, was praised as "an accurate and useful compendium, containing descriptions of all the known species" (Cheeseman 1925, p. xxxii), but there were also objections — "that the descriptions were too scientific for ordinary readers" (Field 1890, p. 3). Then in 1890 came H. C. Field's large book (28 x 22 cm), *Ferns of New Zealand* with 164 pages of text and 29 pages of plates illustrating nearly all the species (Field 1890).

Exhibits of dried ferns 1865-1890

At the New Zealand Exhibition held in Dunedin in 1865, where there were classes for botanical collections, the Governor General exhibited ferns. "His Excellency Sir George Grey, K.C.B. contributes a well-mounted and carefully classified collection of Ferns, stated to have been compiled and arranged by the Misses Sinclair, daughters of the late lamented Dr Sinclair of Auckland." At the same exhibition it is recorded, "A very interesting and well-arranged Book of Ferns, collected and mounted by the Students of St. John's College, Auckland, is exhibited by the Rev. Mr Blackburn, of Taranaki." John Buchanan (well known later for his publications on indigenous grasses) presented "ferns of Otago, comprising 73 species . . . .", and H. F. Logan of Wellington exhibited "undoubtedly one of the best collections in the Exhibition." *(New Zealand Exhibition,* 1865. Reports and awards of the jurors. 532 p.).

Fern collectors in New Zealand were adept at pressing, drying and mounting specimens for display during the latter part of the 19th century and exhibited overseas as well as locally. At the Colonial and Indian Exhibition, London, 1886, there were fern exhibits sent from New Zealand: Mrs C. C. Armstrong of Dunedin, "Framed fern pictures and books of ferns mounted and named"; G. K. Burton of Nelson, T. E. Ellis, of Wanganui and T. C. Tims of Te Puke, all showed albums of New Zealand ferns, and Florence Renshaw, of Auckland, had "Four ornamental cards of ferns." Mrs E. B. Maxwell of Wellington had evidently used fern designs in her "Splash-work curtains of New Zealand ferns." In the Horticultural Section, H. C. Field of Wanganui (author of *The ferns of New Zealand,* 1890) presented a collection of ferns — probably live plants in Wardian cases. *(Catalogue of New Zealand Exhibits.* Colonial and Indian Exhibition, London, 1886. 130 p.).

In Melbourne, at the Centennial International Exhibition, 1888, J. Marshall and W. C. Wells of Hokitika had both sent two books of ferns and E. Maxwell of Opunake had a "large collection of dried ferns" in the New Zealand Court. *(New Zealand Court Catalogue, Centennial International Exhibition, Melbourne,* 1888. 71 p.).

At the New Zealand and South Seas Exhibition held in Dunedin during 1889-90, W. C. Wells was again exhibiting. Here, his albums were labelled "Fancy books of Specimen Ferns". Others who displayed dried ferns at this Dunedin Exhibition were: C. Hicks, Greymouth; Misses L. Manis and N. Falla, Westport; G. M. Thomson, Dunedin; also Miss M. Barclay, whose exhibits were "Plush Curtains, Plush Cushions, and New Zealand Ferns"! *(New Zealand and South Seas Exhibition Dunedin,* 1889-90. *Official Catalogue of the Exhibits.* 304 p.).

New Zealand fern albums ca. 1875

It appears that fern albums were first produced commercially and offered for sale in Auckland in the 1870s. Some elaborate albums had carved or inlaid wooden covers, others were bound in leather. In them the dried fern fronds were delicately arranged as if growing from a velvety base of mosses and lycopods (Fig. 1). These

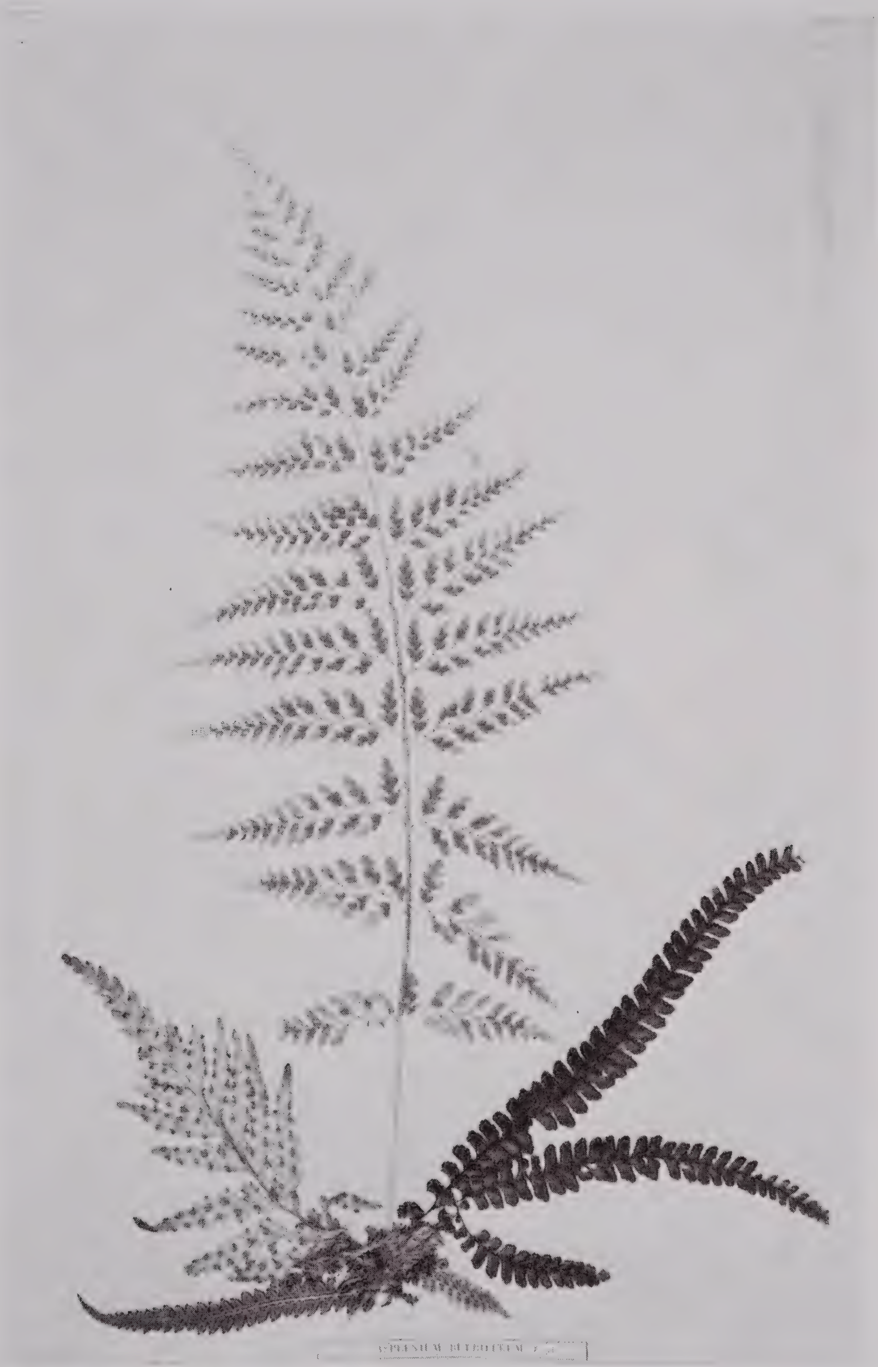


Fig. 1. Page (42.5 x 28 cm) from wooden-covered Eric Craig fern album, *ca.* 1886.

books of ferns were probably more often bought as souvenirs to send away to "the old country" than to adorn occasional tables in New Zealand drawing rooms. "Best Presents for England" ran an advertisement for books of fern specimens collected and mounted by T. Cranwell of Parnell, Auckland, in 1875. This advertisement (Fig.2) appeared in *Ferns which grow in New Zealand and the adjacent islands, plainly described* (L.,H.E.S. 1875). The publisher of this booklet, Edward Wayte, bookseller and stationer of 100 Queen Street, Auckland, also advertised fern specimens for sale — "New Zealand Ferns carefully Mounted on Boards or in Books, kept in Stock, or Prepared to Order, with Carved Mottled Kauri Covers." (Fig. 3). Here, too, Eric Craig, of Princes Street, Auckland, announced that he could "supply, in any quantity, dried specimens of New Zealand Ferns" and would exchange New Zealand ferns for foreign specimens (Fig. 4).

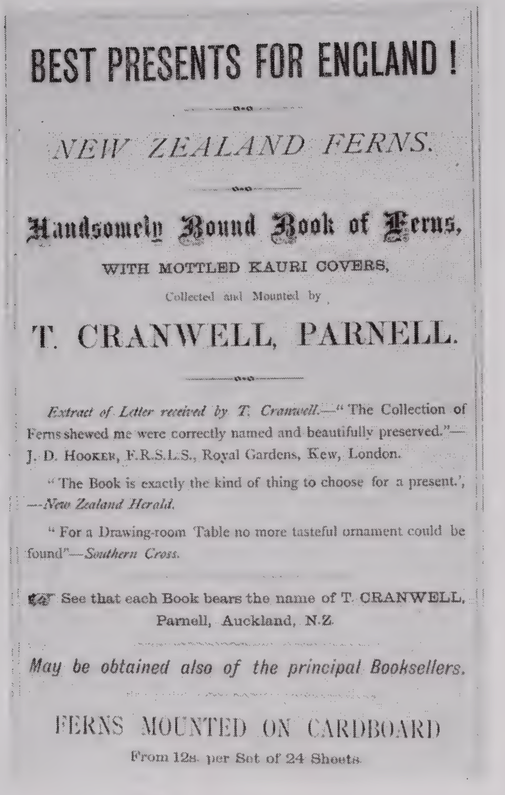
Eric Craig 1829-1923

Enquiries, from both overseas and within New Zealand, about Eric Craig's old fern albums (several of which are held by the Auckland Institute and Museum Herbarium) led to a search for information about his life and work. Details of his family life were provided by a grand-daughter (Mrs Pat Dennis); advertisements pertaining to his shop and the sale of dried fern specimens were found in early New Zealand directories in the Auckland Institute and Museum Library, and correspondence between Craig and Cheeseman was examined in the Museum files.

Eric Craig, (sometimes listed as Ian Eric or John Eric) was born in Scotland in 1829 and came to Auckland via Australia in 1852. In 1855 he married a widow, Mrs Gilberd, who had property in Princes Street (Mrs Dennis, pers. comm.). A daughter, Charlotte Philadelphia, was born on 2 April 1856 (St Pauls Church, Auckland. Register of Baptisms, 1855-1900), and subsequently there were five more children. From 1855 to 1858 Craig apparently lived in Freeman's Bay and practised as a builder (Auckland Provincial Gazette, Electoral Roll 1855-58) and in 1866-67 his address was given either as Symonds Street (Stevens & Bartholomew's New Zealand Directory, 1866-67) or as Collingwood Street (Mitchell and Seiffer's Directory, Auckland, 1866-67). By 1873 when his address was Princes Street (St Pauls Church, Auckland. Register of Baptisms, 1855-1900) he had probably built his own house and it is said that he also had a sash and door factory there at some time (Mrs Dennis, pers. comm.).

In *Wise and Co's New Zealand Directory* for 1878-79 Eric Craig was listed as a carpenter, on the East side of Princes Street only a few doors along from the new Auckland Museum building, opened in 1876, where T. F. Cheeseman was secretary and curator. By 1885 Craig's "fern depot", Princes Street, was listed in Wise's Directory. Besides "fern depot" it was variously known as "Craig's Museum", "Eric Craig's Fern and Curiosity Shop" (Fig. 5) and "Craig's Curiosity Shop" (Fig. 6). Craig built this two-storied shop adjoining his house, right on the street frontage (Fig. 5). Although he sold "all kinds of Maori carvings and curios" (Fig. 6), also shells, kauri gum, greenstone and vegetable caterpillars, ferns were his main concern. He advertised ferns in sets from 12-152 varieties, in books, boxes or on cardboard; also unmounted classified sets for educational purposes (Fig. 6).

It is not known how early Craig's interest in ferns was developed but a letter to Cheeseman in 1874 shows that he was at that time intent on gathering some of the more unusual species in the north — no doubt for inclusion in the collections he offered for sale. From Kawakawa, Bay of Islands, he wrote, asking "what particular kinds of



BEST PRESENTS FOR ENGLAND !

NEW ZEALAND FERNS.

Handsomely Bound Book of Ferns,
WITH MOTTLED KAURI COVERS,
Collected and Mounted by
T. CRANWELL, PARNELL.

Extract of Letter received by T. Cranwell.—" The Collection of Ferns shewed me were correctly named and beautifully preserved."—J. D. HOOKER, F.R.S.L.S., Royal Gardens, Kew, London.

" The Book is exactly the kind of thing to choose for a present.', —*New Zealand Herald.*

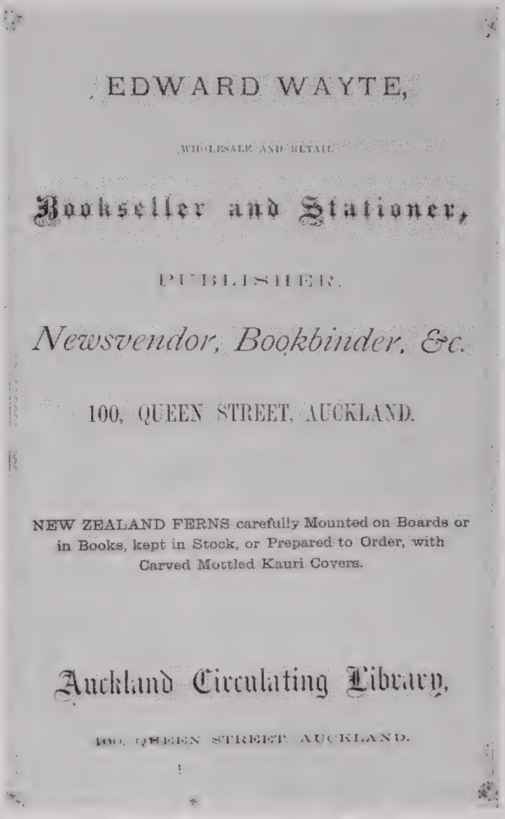
" For a Drawing-room Table no more tasteful ornament could be found"—*Southern Cross.*

☞ See that each Book bears the name of T. CRANWELL, Parnell, Auckland, N.Z.

May be obtained also of the principal Booksellers.

FERNS MOUNTED ON CARDBOARD
From 12s. per Set of 24 Sheets.

2



EDWARD WAYTE,
WHOLESALE AND RETAIL
Bookseller and Stationer,
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100, QUEEN STREET, AUCKLAND.

NEW ZEALAND FERNS carefully Mounted on Boards or in Books, kept in Stock, or Prepared to Order, with Carved Mottled Kauri Covers.

Auckland Circulating Library,
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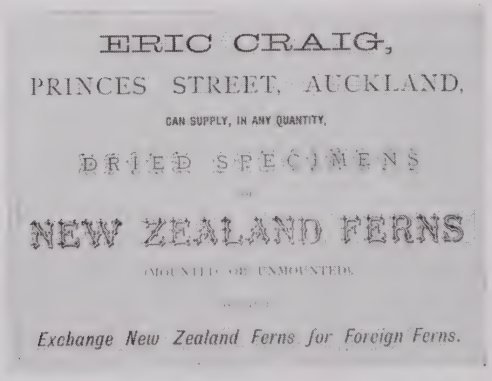
3



ERIC CRAIG,
PRINCES STREET, AUCKLAND,
CAN SUPPLY, IN ANY QUANTITY,
DRIED SPECIMENS
OF
NEW ZEALAND FERNS
(MOUNTED OR UNMOUNTED).

Exchange New Zealand Ferns for Foreign Ferns.

4

Figs. 2-4. Advertisements. 2. T. Cranwell's advertisement (17.6 x 10.6 cm), 1875. 3. Edward Wayte's advertisement (17.6 x 10.6 cm), 1875. 4. Eric Craig's advertisement (10.6 x 8 cm), 1875.

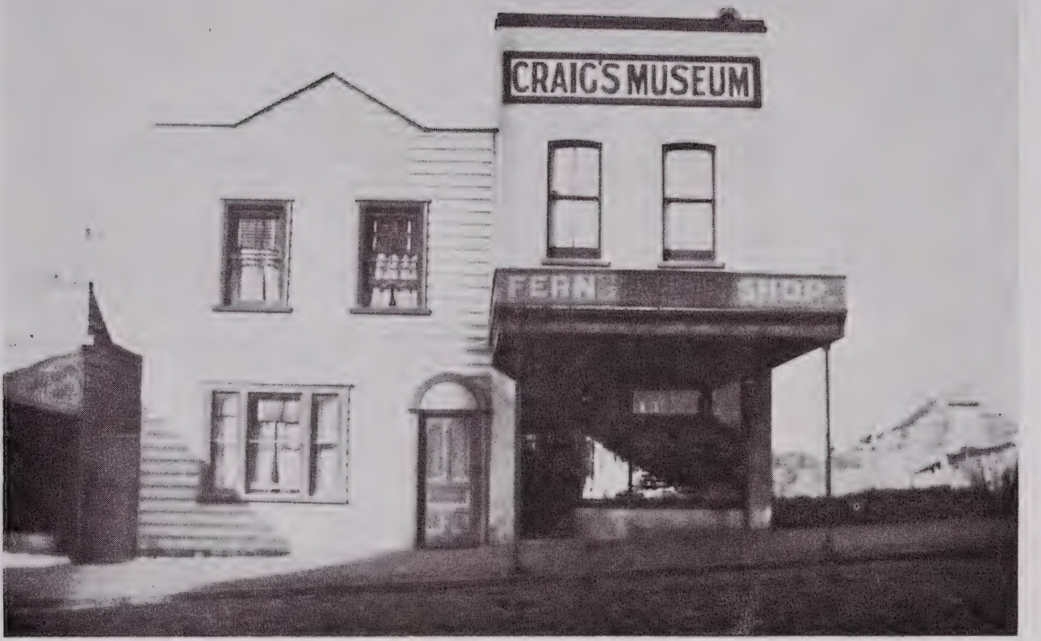
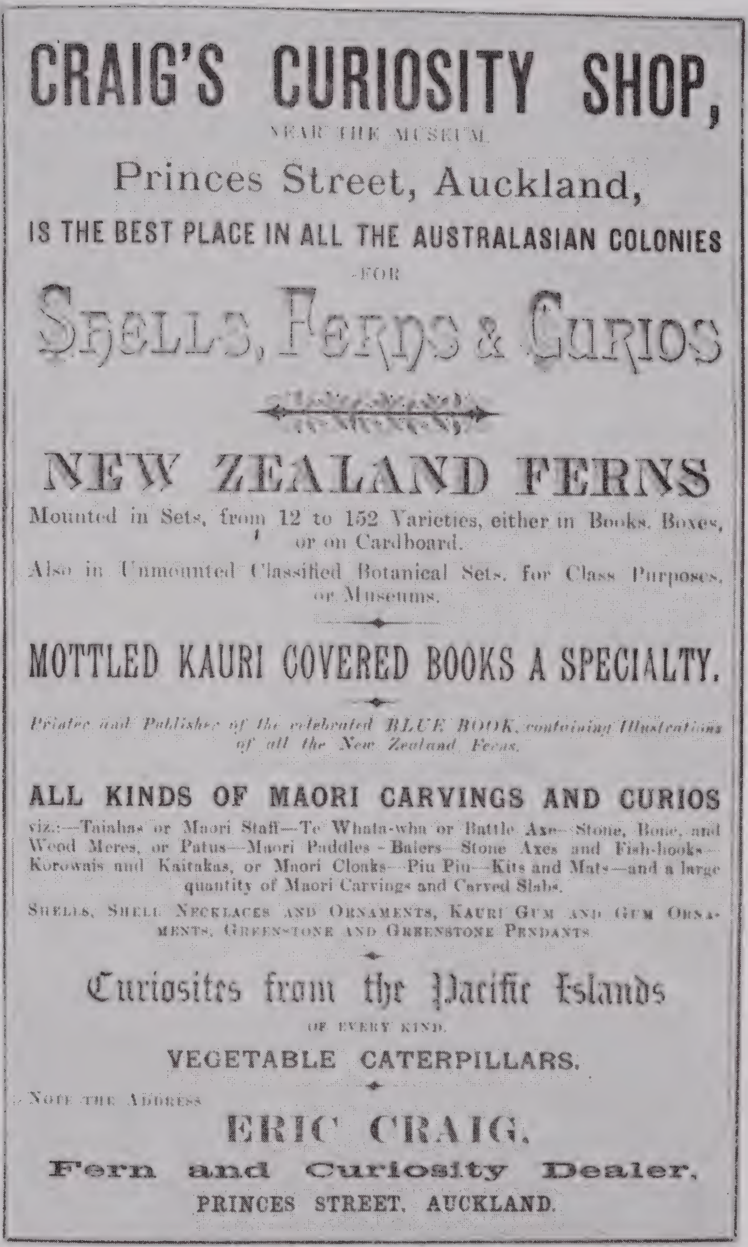


Fig. 5. Craig's Museum, Princes Street, Auckland, *ca.* 1880.

Ferns grow in the Bay of Islands District and the particular place that I should be able to find them" (Craig to Cheeseman 29 October 1874). He wrote again in 1875, saying he had been over all the fern hills in the Kawakawa district but had not been able to find *Botrychium ternatum* or its variety *dissectum* — could Cheeseman tell him "of any settlers house that was near either of them." Neither could he find *Schizea bifida* — "I walked from Mr Bakers place at the head of the Waikare down to Russell and could find fistulosa in several places but I could not see bifida — can I get Todea barbara anywhere near Mongonui . . ." he wrote, adding the remark that when he came back he intended walking overland to Whangarei from Russell (Craig to Cheeseman, February 18, 1875).

A larger supply of fern specimens than Craig himself could provide was needed to maintain a good stock of mounted sheets and fern albums for sale at Craig's Museum and it is likely he paid for material furnished by people in many parts of New Zealand. In one instance a box of dried ferns, mosses and seaweeds, from Fiordland, obviously destined for Craig in the first place, was presented to the Auckland Institute and Museum Herbarium in 1966. The specimens, collected by W. W. Webb at Martins Bay, Fiordland, about 1890, had been held by a family for many years after the collector's decease. In the box with dried ferns was Craig's printed leaflet, "List of New Zealand ferns and lycopods" (Fig. 7), also a copy (Fig. 8) of Craig's "celebrated Blue Book" (Craig *ca.* 1888) as advertised in 1891 (Fig. 6). Inside the cover of this book was written "June 1890 W. W. Webb Martins Bay Otago New Zealand".

The so-called "Blue Book" published by Craig (*ca.* 1888) was almost a facsimile of the book of fern illustrations produced by Herbert B. Dobbie in 1880 (Dobbie



CRAIG'S CURIOSITY SHOP,

NEAR THE MUSEUM,

Princes Street, Auckland,

IS THE BEST PLACE IN ALL THE AUSTRALASIAN COLONIES

FOR

SHELLS, FERNS & CURIOS

NEW ZEALAND FERNS

Mounted in Sets, from 12 to 152 Varieties, either in Books, Boxes, or on Cardboard.

Also in Unmounted Classified Botanical Sets, for Class Purposes, or Museums.

MOTTLED KAURI COVERED BOOKS A SPECIALTY.

Printer and Publisher of the celebrated BLUE BOOK, containing Illustrations of all the New Zealand Ferns.

ALL KINDS OF MAORI CARVINGS AND CURIOS

viz.:—Taiahas or Maori Staff—Te Whata-wha or Battle Axe—Stone, Bone, and Wood Meres, or Patus—Maori Paddles - Balers—Stone Axes and Fish-hooks—Korowais and Kaitakas, or Maori Cloaks—Piu Piu—Kits and Mats—and a large quantity of Maori Carvings and Carved Slabs.

Shells, Shell Necklaces and Ornaments, Kauri Gum and Gum Ornaments, Green-stone and Greenstone Pendants.

Curiosites from the Pacific Islands

OF EVERY KIND.

VEGETABLE CATERPILLARS.

Note the Address

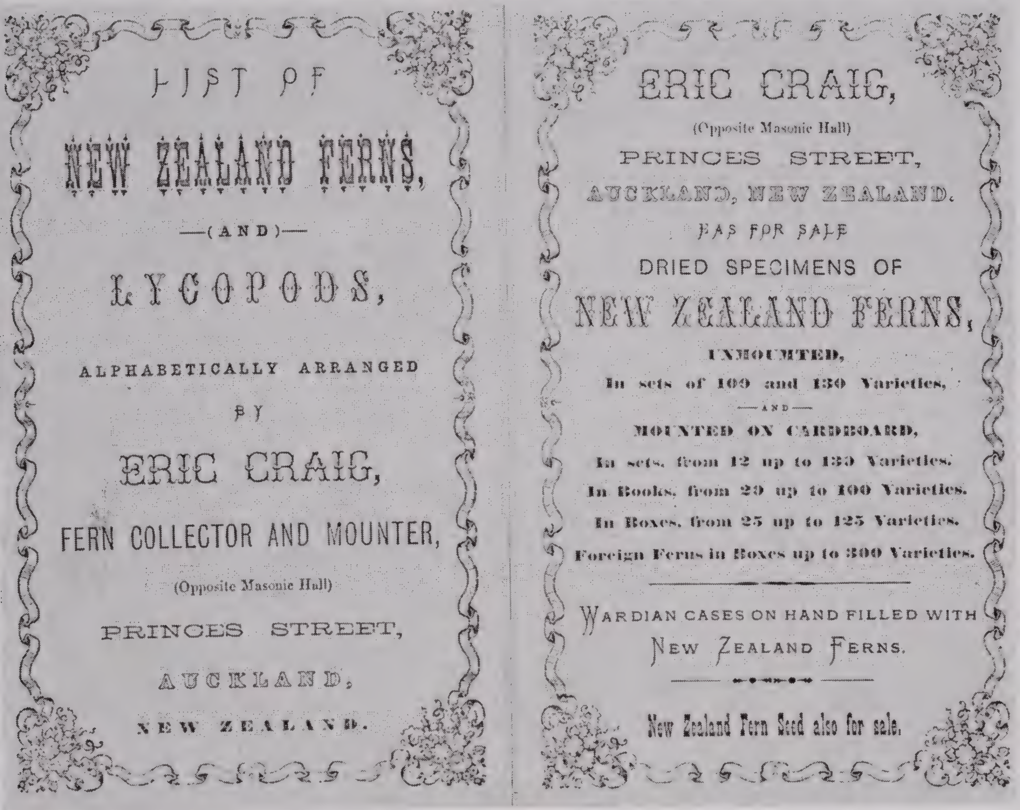
ERIC CRAIG,

Fern and Curiosity Dealer,

PRINCES STREET, AUCKLAND.

Fig. 6. Eric Craig's advertisement (18.2 x 10.8 cm), 1891.

1880c). In fact, Dobbie handed over his plates to Craig (*New Zealand National Bibliography* 2, p. 343). Both of these books, 28 x 21.5 cm, were much the size and softness of a school exercise book and contained 104 pages of named fern illustrations with no text. White silhouettes of life-sized fern fronds were reproduced on bright blue paper. Dobbie, in a letter to the editor of the New Zealand Herald, 4 December, 1880, stated "the method of obtaining the impressions is a simple form of photography or nature printing . . . . " According to an entry in the *New Zealand National Bibliography*



LIST OF

NEW ZEALAND FERNS,

—(AND)—

LYCOPODS,

ALPHABETICALLY ARRANGED

BY

ERIC CRAIG,

FERN COLLECTOR AND MOUNTER,

(Opposite Masonic Hall)

PRINCES STREET,

AUCKLAND,

NEW ZEALAND.

ERIC CRAIG,

(Opposite Masonic Hall)

PRINCES STREET,

AUCKLAND, NEW ZEALAND.

HAS FOR SALE

DRIED SPECIMENS OF

NEW ZEALAND FERNS,

UNMOUNTED,

In sets of 100 and 130 Varieties,

—AND—

MOUNTED ON CARDBOARD,

In sets, from 12 up to 135 Varieties.

In Books, from 20 up to 100 Varieties.

In Boxes, from 25 up to 125 Varieties.

Foreign Ferns in Boxes up to 300 Varieties.

WARDIAN CASES ON HAND FILLED WITH

NEW ZEALAND FERNS.

New Zealand Fern Seed also for sale.

Fig. 7. Front and back pages of Eric Craig's four page leaflet (19.2 x 11.7 cm), *ca.* 1890.

2, p. 343, the illustrations were "Reproductions by dye process of originals mounted on glass". The general appearance is of a book of blueprints.

In both Dobbie's and Craig's blue books, prints of more than one fern were included on some pages with, usually, the localities, as well as the names, of the specimens depicted. Craig added some new illustrations and not only re-arranged many of Dobbie's plates but also changed localities. This was not in accordance with Dobbie's practice. He claimed, in his letter to the New Zealand Herald quoted above (see above, p. 69) "The habitat given is where each individual specimen was gathered." In this letter Dobbie also wrote, "The book is intended more as a help to fern collectors than as a scientific work although the ferns are named and arranged in accordance with "Hooker and Baker's Synopsis Filicum . . . . " He acknowledged "the valuable assistance from T. F. Cheeseman F.G.S. and Mr Craig of Princes St." No doubt it was because of Craig's help, probably in the way of providing specimens for illustration, that Dobbie handed over the plates to him.

In the *New Zealand National Bibliography* 2, p. 343 only one issue of Craig's Blue Book is listed and it is named as a second edition of Dobbie's book of illustrations of 1880. This is not correct and it is here established that Craig himself produced two editions of blue print illustrations. The first edition (Craig *ca.* 1888), entitled "New Zealand Ferns. 167 varieties illustrated by Eric Craig fern mounter

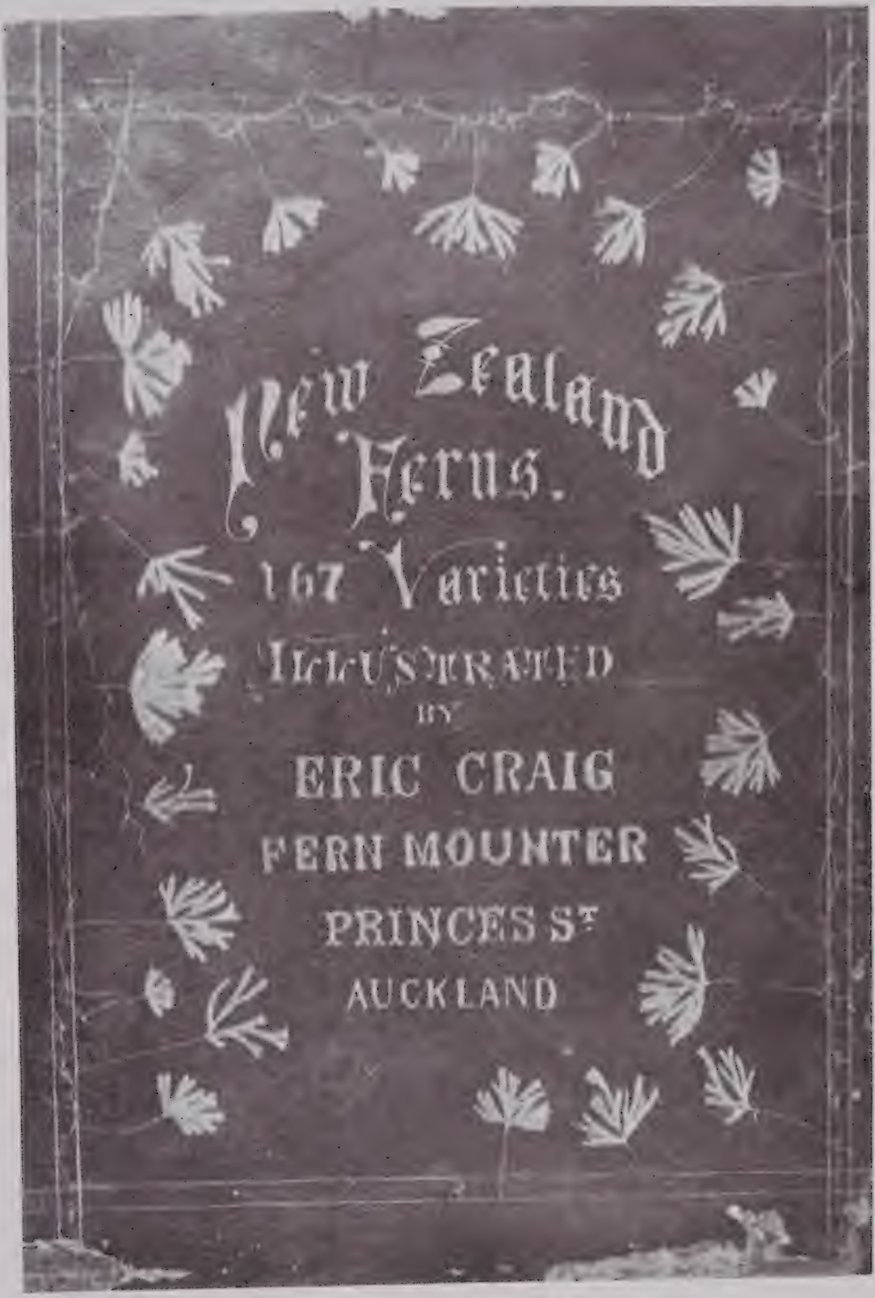


Fig. 8. Cover of Eric Craig's "Blue Book" (28 x 21.5 cm), *ca.* 1888.

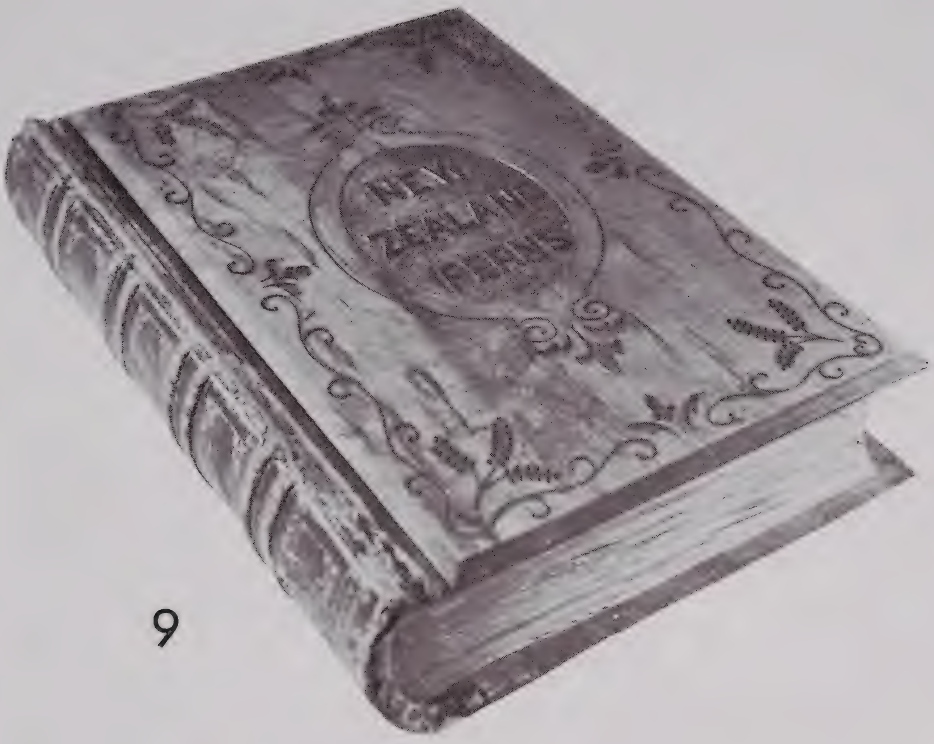
Princes St. Auckland" (see Fig. 8), was probably published before 1890 as the copy held in the Auckland Institute and Museum Library has the date "June, 1890" together with the owner's name handwritten inside the cover. The second edition (Craig *ca.* 1892), besides being labelled as such, had five more illustrations — "New Zealand Ferns. 172 varieties illustrated by Eric Craig fern mounter Princes St Auckland 2d ed." (as listed in *New Zealand National Bibliography* 2, p. 343). A copy of the second edition is held by the library of Botany Division, DSIR, Lincoln, Christchurch (B. Macmillan pers. comm.).

As well as dried material Craig must have had a supply of live plants for sale. In one of his earliest advertisements (Fig. 7) he offered "Wardian cases on hand filled with New Zealand ferns." It is likely that any demand for Wardian cases came from horticulturists or botanists, requiring to ship fern plants overseas for exhibitions or for botanic gardens, rather than from local fern enthusiasts. "Few Colonial houses have room enough inside them for fern stands, with bell glasses over them, to contain delicate ferns; or better still Wardian cases" wrote H. C. Field in *The ferns of New Zealand* (Field 1890, p. 33). In this publication Field devoted 8 pages to the cultivation of ferns as well as giving instructions for mounting dried specimens. He suggested "if you wish them for inspection of ordinary and non-scientific friends, who would be likely to handle them carelessly, it is better to mount them in a scrap-book" and gave several methods of gluing them down (Field 1890, p. 25). Craig glued his specimens very firmly in the old fern albums now in the Auckland Institute and Museum Herbarium and they have withstood plenty of handling.

Two of Craig's large fern albums in the AK Herbarium are complete with carved mottled kauri covers, as advertised (Fig. 6). The larger album (Fig. 9), which has "For Mama With best love Waiheke Island New Zealand January 1887" handwritten on the fly leaf, was presented to the Herbarium in 1952. Bound by Wilson and Horton expressly for Craig, the volume measures 45 x 32 cm, is 10 cm thick and contains 152 dried New Zealand fern specimens, all in good condition, firmly glued on to large pages of white card hinged with linen. Each fern frond, or portion thereof, springs from a base of bright green mosses, lycopodium or small leaflets of various ferns obviously added as decoration. The scientific plant name, printed below each collage, only applies to the central frond (Fig. 1) — no names are given for the lowly mosses and lycopods. The smaller album (Fig. 10), 35 x 28 cm and 4 cm thick, also with a carved cover, was donated in 1976. It has Eric Craig's yellow label inside (Fig. 11) but no date of production.

Other large leather-bound albums of New Zealand ferns presented to the Herbarium over the years have specimens collected as early as 1864 ("gathered in Feby. 1864 by J.J. for E.M.R."), 1883, 1884-85 and 1898. Some of the books have no dates and no clues as to collectors of the ferns.

As well as Craig's handsome wooden-covered books and old leather-bound volumes (one recently presented by the Botany Department, Victoria University of Wellington) the Auckland Institute and Museum Herbarium has also acquired a small wooden box (Fig. 12) as advertised by Craig, which contains 25 miniature sheets (21 x 14 cm) of dried ferns. The kauri box (27 x 19 cm) is beautifully made, in the shape of a book, with a hinged and latched lid which has a fern design in "splashwork" on it (Fig. 13). This box was presented recently through the University of Auckland, Botany Department, coming from a deceased estate.



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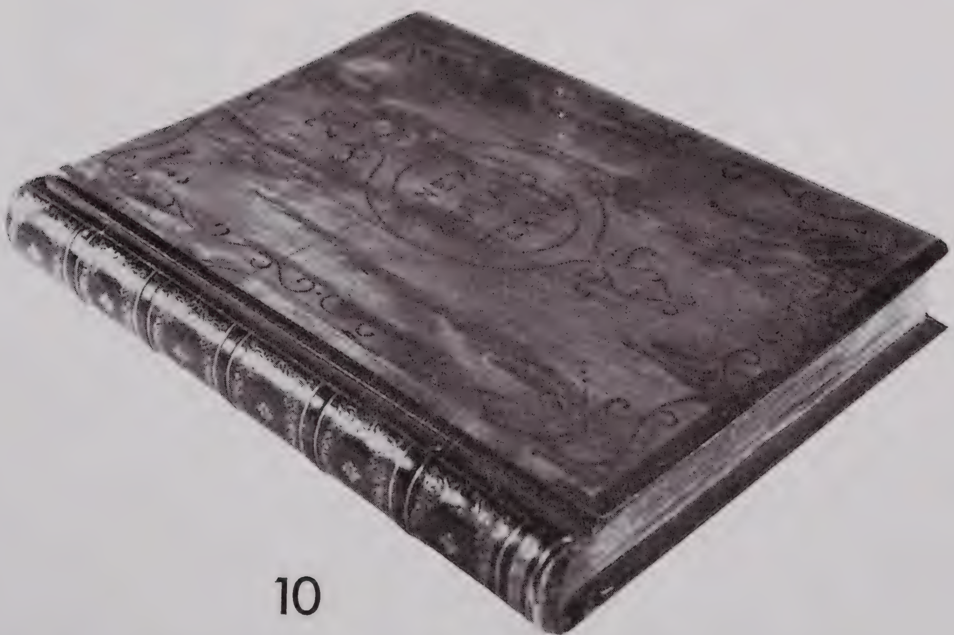

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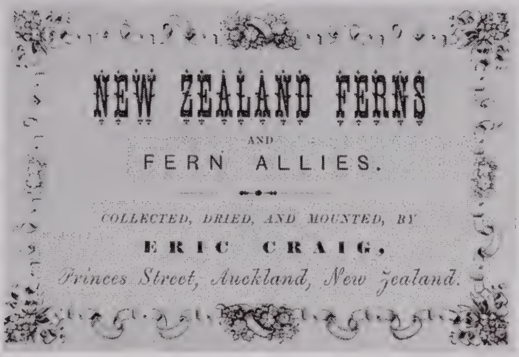
Figs. 9, 10. Wooden-covered Eric Craig fern albums. 9. Album (45 x 32 x 10 cm), *ca.* 1886, presented to Museum 1952. 10. Album (35 x 28 x 4 cm), presented to Museum 1976.



NEW ZEALAND FERNS

AND

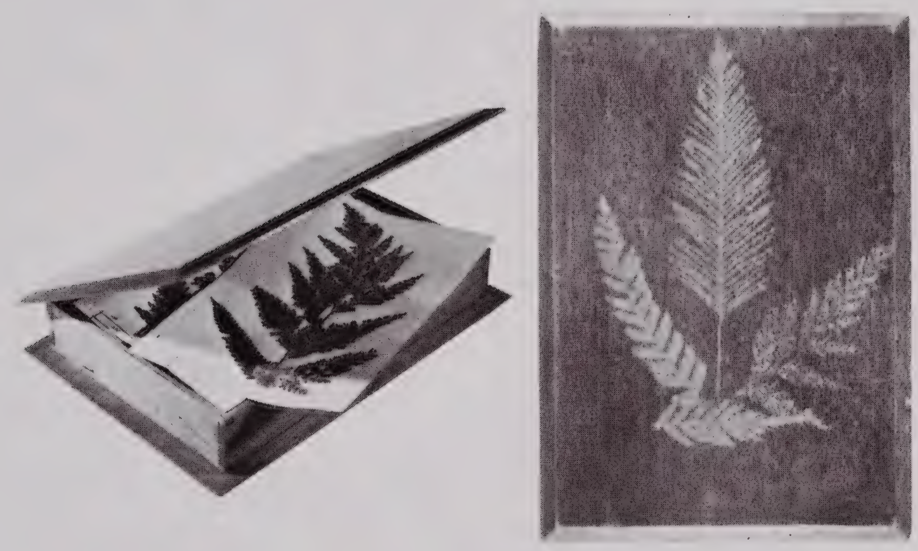
FERN ALLIES.

COLLECTED, DRIED, AND MOUNTED, BY

ERIC CRAIG,

Princes Street, Auckland, New Zealand.

Fig. 11. Eric Craig's yellow label (12 x 8.5 cm) inside fern album.



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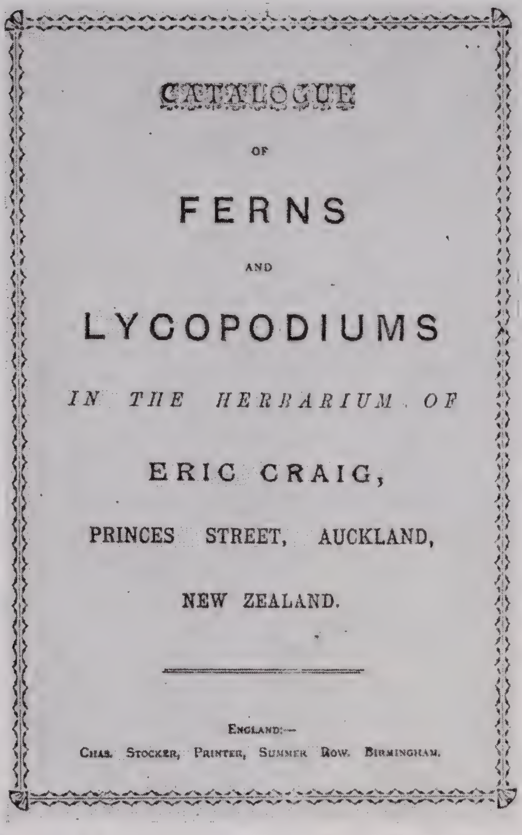
Figs. 12, 13. Eric Craig's wooden box (27 x 19 x 5 cm) of miniature sheets of ferns. 12. Box showing mounted specimens. 13. Lid of box showing fern design on wood.

Of considerable value, are the hundreds of native and exotic fern specimens mounted by Craig and presented by him to the Auckland Institute and Museum in January 1923 (see below, p. 78). Many of Craig's cardboard sheets of overseas specimens provide the only reference material, in the AK Herbarium, of fern species from certain countries: e.g. *Lindsaea heterophylla,* Ceylon; *Cheilanthes ferruginea,* Jamaica; *Asplenium fissium,* Turkey; *Adiantum caudatum,* Cape Verde Islands; *Adiantum flabbelulatum,* Hongkong; *Adiantum lucidum,* Trinidad; etc.

Not all the above ferns were listed in Craig's 31 page catalogue entitled, "Catalogue of ferns and lycopodiums in the herbarium of Eric Craig, Princes Street, Auckland" (Fig. 14), printed in England by Chas. Stocker, Summer Row, Birmingham (Craig *ca.* 1890). This catalogue would have had a wide distribution to overseas



CATALOGUE

OF

FERNS

AND

LYCOPODIUMS

IN THE HERBARIUM OF

ERIC CRAIG,

PRINCES STREET, AUCKLAND,

NEW ZEALAND.

ENGLAND:—
CHAS. STOCKER, PRINTER, SUMMER ROW. BIRMINGHAM.

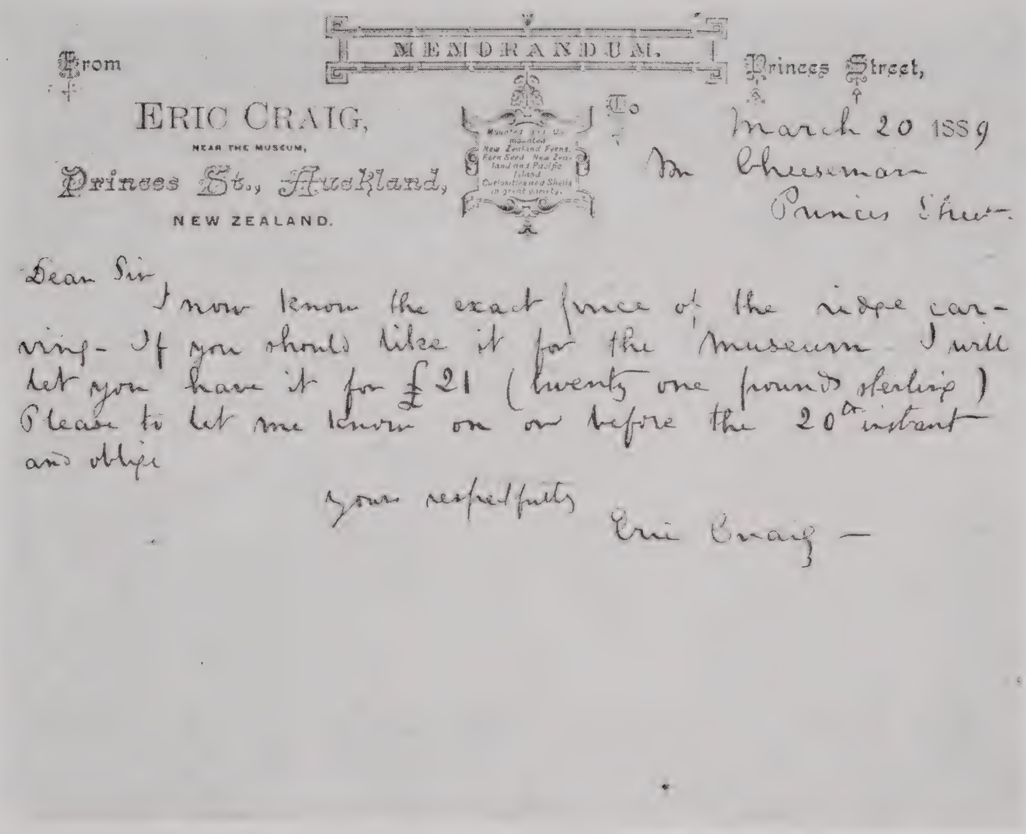
Fig. 14. Cover of Eric Craig's fern catalogue (18 x 12 cm), *ca.* 1890.

herbaria and plant collectors. Craig had a note in it to the effect that he was willing to make exchanges, offering 140 varieties of New Zealand ferns "for any Dried botanical, seeded specimens of Ferns foreign to New Zealand, that are not mentioned in this catalogue."

"Foreign ferns in Boxes up to 300 varieties" (Fig. 7) were presumably obtained as a result of the catalogue — as exchange from overseas herbaria to which Craig sent specimens. Lanjouw and Stafleu (1954) listed Craig specimens in the following herbaria: F. (Field Museum of Natural History, Chicago, U.S.A.), M.B.G. (?Missouri Botanical Gardens, St Louis, U.S.A.) and WELC (Wellesley College, Massachussetts, U.S.A.).

Craig also collected Maori carvings and artifacts which were advertised for sale at his fern and curiosity shop in Princes Street. From 1889 to 1923 it is recorded that many Maori artifacts came from Eric Craig to the Auckland Museum (an accession of 1922 listed 19 Maori carvings) — some were presented and some were purchased (see letter, Fig. 15).

In the "Catalogue of Curiosities, etc. in the Private Collection of Eric Craig" (Craig 1916) there were many Pacific Island curios listed as well as Maori items — also a "Fern Cabinet Herbarium containing 1200 different varieties of named ferns



MEMORANDUM.

From
ERIC CRAIG,
NEAR THE MUSEUM,
Princes St., Auckland,
NEW ZEALAND.

Mounted and Unmounted New Zealand Ferns. Fern Seed. New Zealand and Pacific Island Curiosities and Shells in great variety.

To Mr Cheeseman
Princes Street

Princes Street, March 20 1889

Dear Sir
I now know the exact price of the ridge carving - If you should like it for the Museum I will let you have it for £21 (twenty one pounds sterling) Please to let me know on or before the 20th instant and oblige

Yours respectfully
Eric Craig —

Fig 15. Letter from Eric Craig to T. F. Cheeseman, 20 March 1889.

mounted on cardboard." The printed catalogue was a guide to the collections retained, and added to, by Craig after he gave up his business in Princes Street about 1912. Still at 8 Princes Street in 1910 *(Cleaves Auckland Directory,* 1910), by 1912 Craig's address was Wainoni, an early name for an area near Greenhithe.

Before he retired from business Craig had, in 1905, purchased 40 acres of land, beside Oruhamo or Hellyers Creek, Greenhithe, on the upper reaches of the Waitemata Harbour (King 1975). Here he proceeded to make a private park, planting trees, forming paths and cutting steps up the cliff from the water's edge. In a pamphlet he had printed by Wilson and Horton (Craig *ca.* 1907) entitled "History of Tauhinu (now Tauhinu Park), Oruhamo Creek, Greenhithe.", he gave the Maori history of the fortified pa situated there and he wrote of Tauhinu Park: "Nature commenced the work, but left the hands of man to finish and beautify. There are hills to climb, glens to stroll through, banks or braes to rest or lounge on, streams and swamps (the home of the raupo), bush and forest to wander amongst, with shrubs, and ferns in endless variety . . . . . " .

The property was named Tauhinu Park after the old fortified pa on the highest ground — the name tauhinu coming from the native shrub, *Pomaderris phylicifolia* var, *ericifolia* which Craig said was "common among the scrub in the district". It may still be found there. When he left Princes Street, Craig built a house on the Greenhithe property which he called "The Manor House" and while

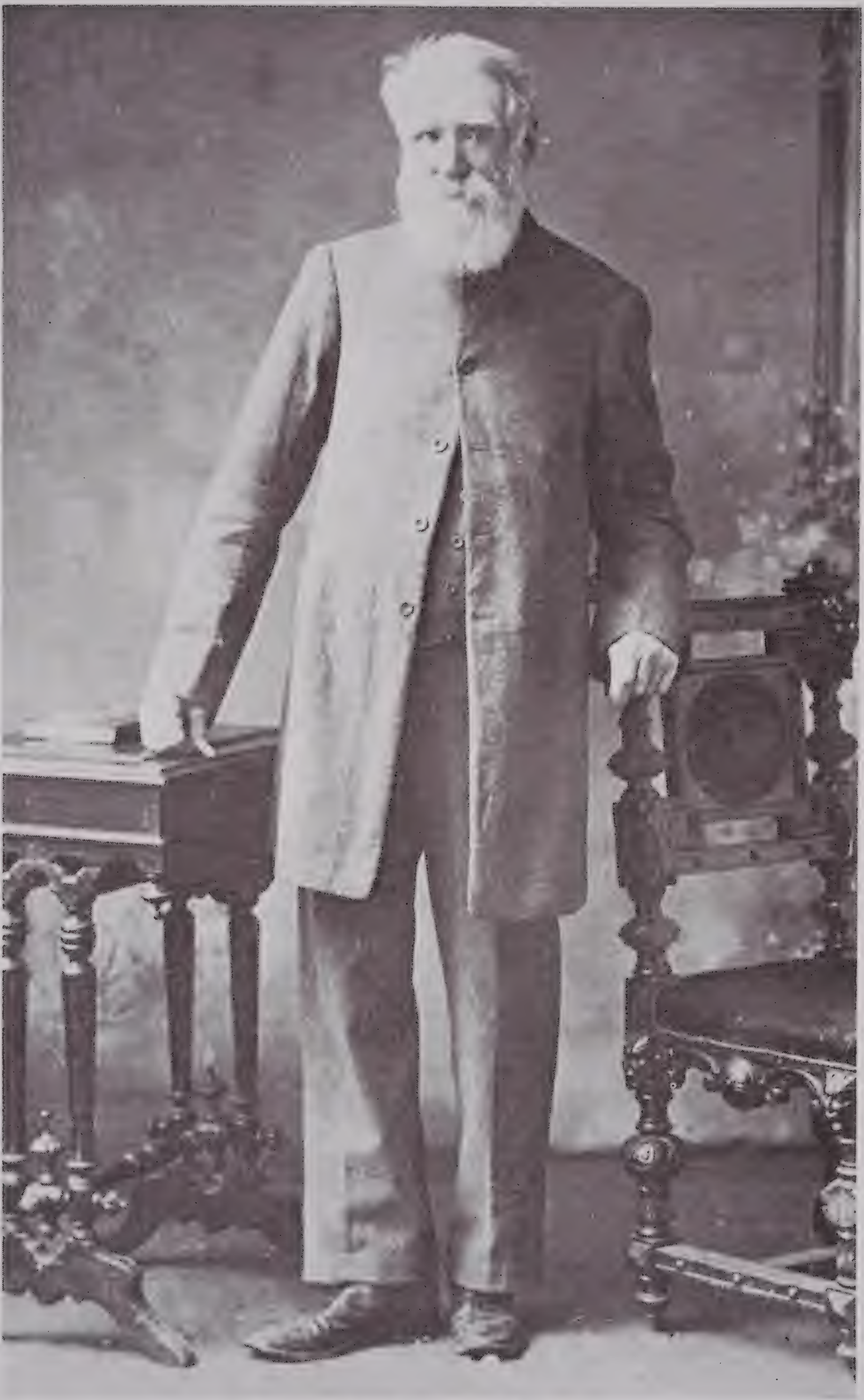


Fig. 16. Eric Craig aged 81 years.

this was being built he stayed with a daughter and her family on their fruit farm near Greenhithe. It is said that he walked 1½ miles (2.41 km) from the farm to Tauhinu Park every day to supervise the building of his Manor House (Mrs Dennis pers. comm.). This was at the age of 83 or 84! When he went to live in the Manor House he kept his personal collection of curios and ferns there. During the first world war Craig opened a "Patriotic Shop" in Eden Terrace, Auckland, where he sold surplus items from his collections in aid of the national patriotic funds (Dr A. W. B. Powell pers. comm.).

Eric Craig liked to visit England every ten years or so (Mrs Dennis pers. comm.) and on his 81st birthday, in 1910, had his photograph taken in London (Fig. 16). Towards the end of his long life, though inactive and nearly blind, Craig continued to write coherent letters — several to Cheeseman, before consigning his remaining fern collections to the Museum.

From the Manor House, Tauhinu Park, Greenhithe, 16 December, 1922, Craig wrote:

> "I have a very large collection of Fern Fronds from all parts of the World, well preserved and in excellent condition — fixed each on to cardboard sheets 17 inches in length and 10 inches wide — made into folding Books — containing each a different number of leaves — so that you can examine each fern separately and open out as far as the number of sheets will allow — I have of Ferns mounted in that way 1150 specimens or you may almost say Varieties . . . . They are all in the cardboard Books and the Books are kept in Drawer Boxes of which there [are] 24 in two rows of 12 drawers high. The size of case in which the Drawers are pushed or pulled in or out is each one four feet two inches high and 21 inches wide. If you will oblige by letting me know if they will be of any use to you, at your earliest convenience I will then at once act according to your answer . . . "

Lastly he wrote to Cheeseman in January 1923 (the year in which Craig died, aged 94), "I am glad you have accepted my collection of mounted Ferns from all parts of the World and I will forward them to you with some old Maori Carvings in Wood that I have in my private Museum for many years . . . . " These mounted ferns still form a major part of the overseas reference collection in the Auckland Institute and Museum Herbarium.

Acknowledgements. I am most grateful to Mrs Pat Dennis for providing information about her grandfather, Eric Craig, and for the loan of photographs. Thanks are also due to the Botany Departments of University of Auckland and Victoria University of Wellington for donating fern albums and a wooden box of mounted ferns to the Auckland Institute and Museum Herbarium; also to Botany Division, DSIR, Christchurch, for checking their collections for Craig material.

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THREE NEW INTERTIDAL SPECIES OF LIMNICHIDAE (COLEOPTERA) FROM NEW ZEALAND

E. B. Britton

CSIRO, DIVISION OF ENTOMOLOGY, CANBERRA, AUSTRALIA

Abstract. Hyphalus kuscheli, H. prolixus and *H. ultimus* spp. n. are described. The new species occur at and below high water mark on barnacle-encrusted rocks on beaches on the north-east coast of the North Island of New Zealand.

The genus *Hyphalus* has so far been represented by two species, *H. insularis* Britton (1971) (Fig. 2) from the north-east coasts of Australia, and *H. wisei* Britton (1973) (Figs. 3, 6) known only from Leigh on the north-east coast of the North Island of New Zealand. While collecting *H. wisei* near Leigh, Dr G. Kuschel recently made the surprising discovery that another closely allied species of *Hyphalus* replaces *H. wisei* a few metres higher on the shore. The new species, *H. kuscheli*, is described below. Later, I received from Mr K. A. J. Wise 34 specimens of the genus from localities in the Bay of Islands (*c.* 35°15′S, 174°13′E). Seven of these proved to belong to *H. kuscheli* and the remainder to two additional new species which are described here as *H. prolixus* sp. n. and *H. ultimus* sp. n.

All three species were first collected, in the Bay of Islands, by Mrs J. M. Gurr in March 1975, additional specimens of *H. prolixus* and *H. ultimus* were taken on Moturoa I off Karikari Peninsula in May 1976 by Mr P. MacDonald, and further specimens of *H. prolixus* on Karikari Pen. in September 1976 by G. Kuschel.

Abbreviations used in the text

AM	Auckland Museum Collection
ANIC	Australian National Insect Collection, Canberra
ED	Entomology Division Collection, Department of Scientific and Industrial Research, Auckland.

Key to the species of *Hyphalus*

1 Posterior angles of the pronotum acute, subrectangular; pronotum less transverse, ratio length: width *c.* 1.60:1 2

Posterior angles of the pronotum obtuse; pronotum more transverse, ratio width: length *c.* 1.7:1 4

2(1) Setae on the apical declivity of the elytra (view in profile) not of two different lengths; elytra less elongate (ratio length:width *c.* 1.30:1) (Fig. 2) (E Australia) .... **insularis** Britton

Setae on the apical declivity of the elytra of two distinct lengths; elytra more elongate (ratio length:width *c.* 1.45:1) (NE New Zealand) 3

Rec. Auckland Inst. Mus. 14: 81-85 10 December 1977

3(2) Surface of pronotum and elytra bearing obvious tubercles (Fig. 8); the longer setae on the elytra about 2 x length of shorter setae .... **kuscheli** sp. n.

Surface of pronotum and elytra without obvious tubercles; the longer setae on the elytra conspicuous, about 4 x length of the shorter setae (Fig. 4) ... **ultimus** sp. n.

4(1) Antennal segments 4 and 5 longer than broad (ratio length:width *c.* 1.3:1); setae on the base of the pronotum just before the scutellum directed obliquely backwards and outwards (Fig. 5); eye with 30 facets .... **prolixus** sp. n.

Antennal segments 4 and 5 not elongate (ratio length:width *c.* 1.0:1); setae on the base of the pronotum just before the scutellum directed obliquely backwards and inwards; eye with 26-29 facets (Figs. 3, 6) .... **wisei** Britton

Hyphalus kuscheli sp. n. (Figs. 1, 7, 8)

Length 1.2-1.6 mm, maximum width (of elytra) 0.65-0.68 mm. Colour: whole body surface black, densely clothed with short, whitish or colourless setae which give the insect a greyish appearance. Legs very dark brown; palpi and antennae black. Setae of two kinds, more numerous, recumbent, shorter setae and longer, more erect but less numerous setae. Dorsal surface of head, pronotum and elytra with minute, sparse, but fairly uniformly distributed tubercles (see pronotum in Fig. 8). Pronotum ratio greatest width:mid length 1.6:1. Elytra ratio greatest width:mid length *c.* 1.45:1. Separation of the hind coxae as in *H. wisei* (ratio width between coxae:width of one coxa 1.0:1). Antennal segments 4-6 elongate (ratio length:width *c.* 1.5:1). Setae on pronotum close to the scutellum directed backwards and outwards. Eye composed of 31 facets (Fig. 7). Aedeagus with median lobe distinctly shorter than the parameres (Fig. 1).

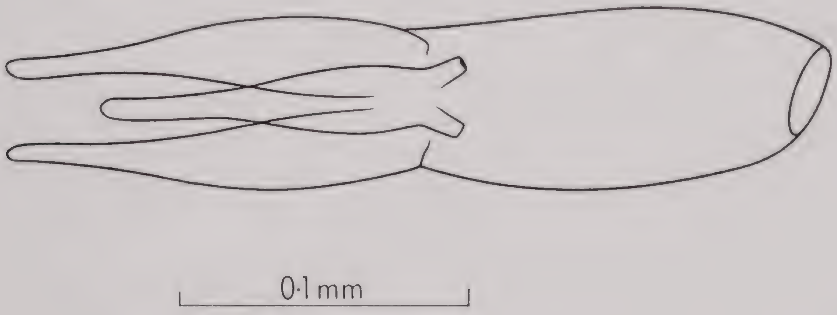
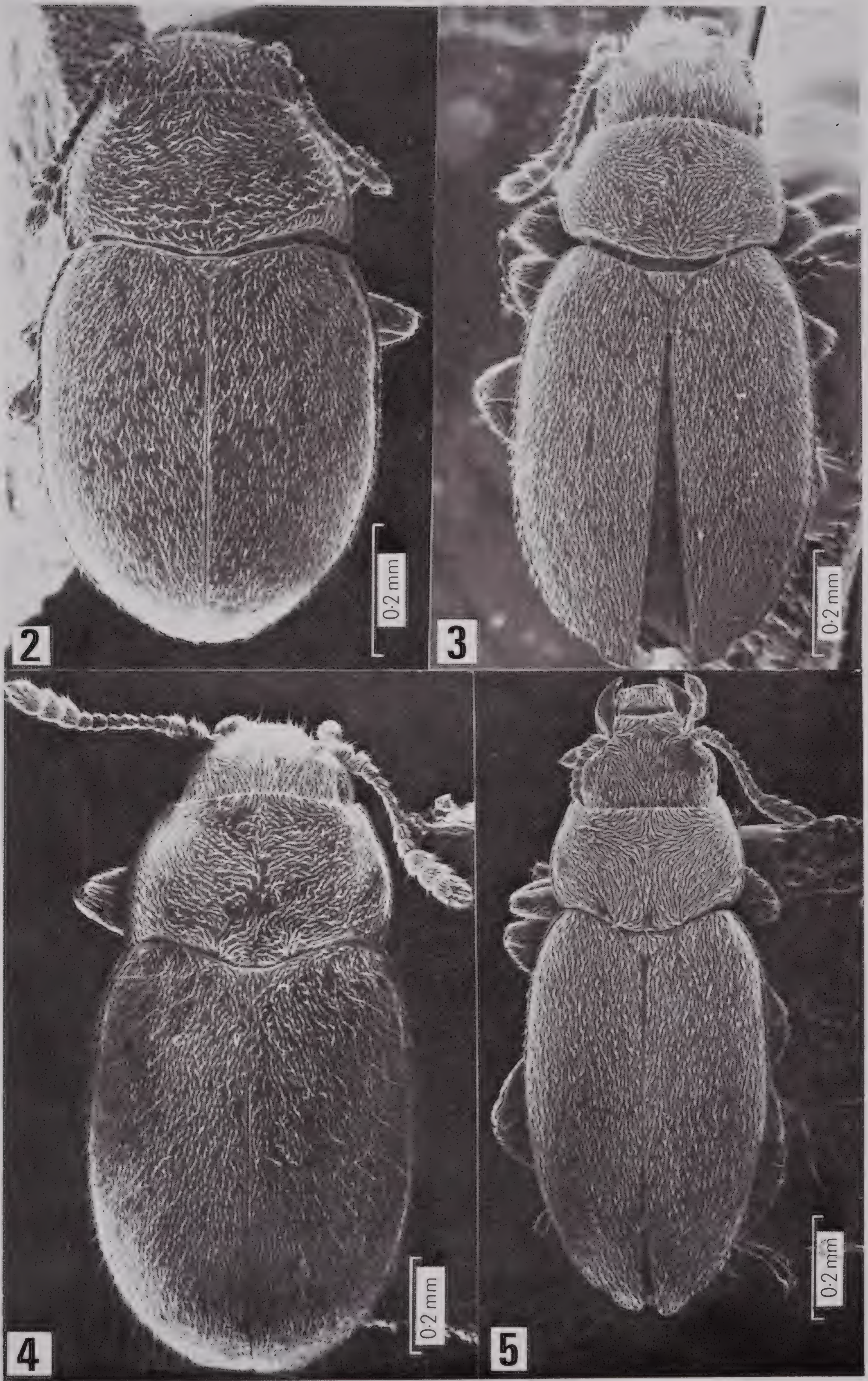


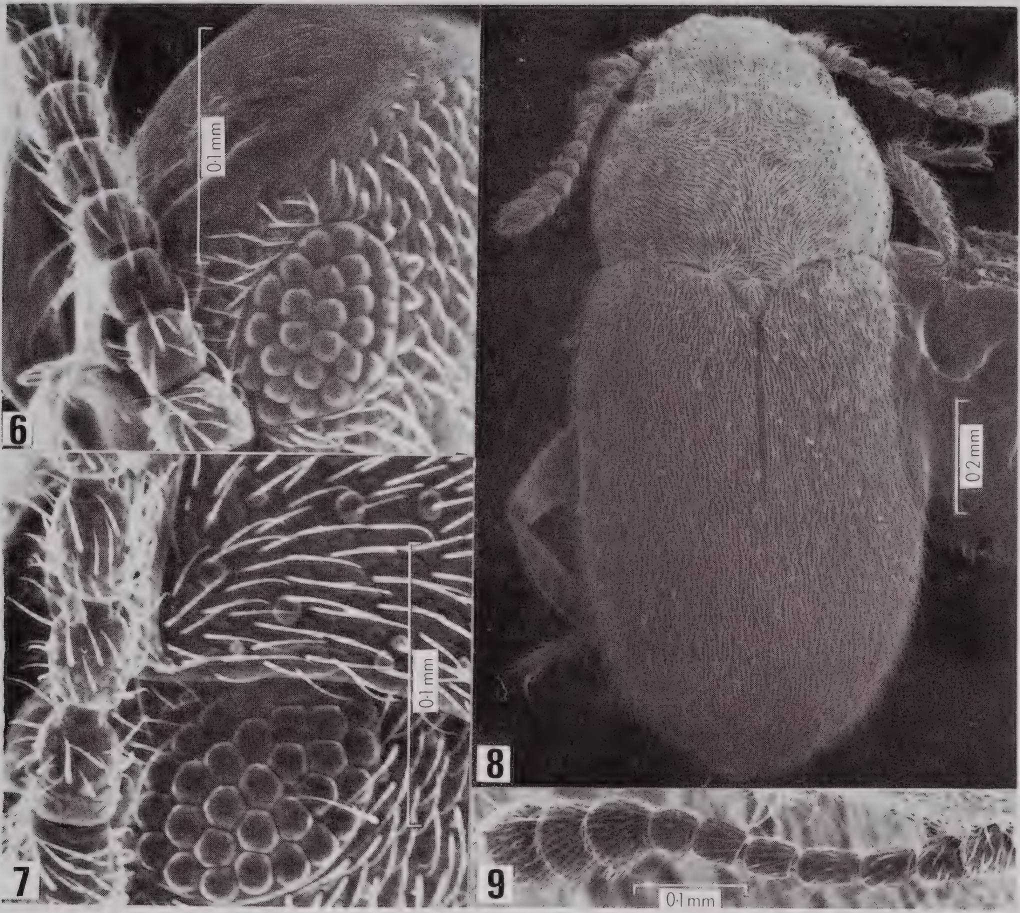
Fig. 1. *Hyphalus kuscheli.* Aedeagus.

Types. Holotype ♂. NEW ZEALAND: North Island, near Leigh, (36°16′S, 174°48′E), Marine Research Station of the Zoology Department, University of Auckland, on the shore in the upper littoral zone, characterized by the barnacle *Chamaesipho brunnea,* 3. ii. 1976, G. Kuschel, ED. Paratypes, locality as for holotype, 23. i. 1976, 3. ii. 1976, 20. viii. 1976, G. Kuschel, 9, ED, AM, ANIC; Bay of Islands, Napia Bay (35°10′S, 174°03′E), 6. iii. 1975, J. M. Gurr, in rock crevice, at high water mark (below recent spring h.w.m.), 7, AM, ED, ANIC.

Dr Kuschel observes that *Hyphalus kuscheli* and *H. wisei* occur at different levels on the same beach. *H. kuscheli* is found just above mean high tide level in the splash zone which is kept moist by waves only about high tide. This is confirmed by the fact that the specimens from the Bay of Islands were also taken at the high water mark. This is the upper littoral zone characterized by the crust formed by the barnacle *Chamaesipho brunnea. H. wisei* occurs lower on the beach, in the mid-littoral zone characterized



Figs. 2-5. *Hyphalus* spp. 2. *H. insularis*. 3. *H. wisei*. 4. *H. ultimus*. 5. *H. prolixus*.



Figs. 6-9. *Hyphalus* spp. 6. *H. wisei.* Eye and antennal segments 2-8. 7. *H. kuscheli.* Eye and antennal segments 3-6. 8. *H. kuscheli.* Dorsal. 9. *H. ultimus.* Antenna.

by the barnacle *Chamaesipho columna,* a level which is normally submerged for about two hours at each tide. This is also the habitat of the intertidal pseudoscorpion *Maorichthonius mortenseni* Chamberlin. The beetles are associated with the barnacle crust which, with the death of some individuals, becomes porous. The barnacles are on the substrate of hard sandstone and there are no boulders on the shore. The locality is sheltered, in contrast to the west coast of the North Island where Dr Kuschel has searched the intertidal zone near the mouth of Manukau Harbour for *Hyphalus* spp., without success.

Dr Kuschel has noted that the eggs of *Hyphalus kuscheli* are so large that the abdomen could not accommodate more than two. The ovipositor is also very long (*c.* 0.6 mm, or almost half the body length) and heavily sclerotised. The large eggs doubtless permit a shortened free larval life and the long, strong ovipositor allows the eggs to be deposited in crevices in the substrate, both adaptations to the harsh conditions of wave action and alternate wetting and drying necessarily suffered by an intertidal species.

Hyphalus prolixus sp. n. (Fig. 5)

Length *c.* 1.4 mm. Colour black, with a uniform clothing of short, semierect, colourless setae. Antennae with segments 4 and 5 elongate (ratio length:width *c.* 1.3:1). Eye composed of 30 facets. Pronotum ratio greatest width:mid length *c.* 1.74:1, the posterior angles obtuse. Elytra elongate-ovoid, ratio greatest width:mid length 1.30-1.60:1. Setae on base of pronotum, just anterior to scutellum, directed obliquely backwards and outwards.

Types. Holotype ♂. NEW ZEALAND: North Island, Joliffe Point, (34°50′S, 173°25′E), Matai Bay, Karikari Peninsula ND, mid to upper littoral zone, 22.ix.1976, G. Kuschel, ED. Paratypes, data as for holotype, 12, ED, ANIC; Moturoa I, (34°47′S, 173°22′E), Cape Karikari, v.1976, P. MacDonald, 4, AM; Bay of Islands, Moturua I, (35°13′S, 174°12′E), Otupoho Bay, in rock crevice below high water mark, 26.iii.1975, J. M. Gurr, 14, AM, ED, ANIC; Bay of Islands, Te Hue (35°15′S, 174°13′E), in rock crevice below high water mark, 4.iii.1975, J. M. Gurr, 1, ANIC; Bay of Islands, Urupukapuka I, (35°13′S, 174°14′E), Entico Bay in rock crevice below high water mark, 28.iii.1975, J. M. Gurr, 5, AM; Bay of Islands, Waewaetorea I, (35°12′S, 174°13′E), in rock crevice below high water mark, 1.iii.1975, J. M. Gurr, 1, AM.

H. prolixus is quite similar to *H. wisei* (Fig. 3) but can be distinguished by the larger eye, by the fact that the setae at the mid-base of the pronotum are directed obliquely outwards whereas in *H. wisei* they are directed obliquely inwards, and by the more elongate 4th and 5th antennal segments.

Hyphalus ultimus sp. n. (Figs. 4, 9)

Length *c.* 1.3 mm, maximum width (of elytra) *c.* 0.67 mm. Colour black, densely clothed with colourless setae. Setae of two kinds as in *H. kuscheli* but with the longer setae markedly longer and more erect than in that species. Head, pronotum and elytra without tubercles. Pronotum ratio greatest width:mid length *c.* 1.6:1. Elytra ratio length: width *c.* 1.35:1. Setae on base of pronotum, just anterior to scutellum, directed obliquely backwards and outwards. Antennal segments 4, 5 and 6 elongate, ratio length:width of segment 5, *c.* 1.65:1. Eye composed of 32 facets.

Types. Holotype. NEW ZEALAND: North Island, Moturoa I, (34°47′S, 173°22′E), Cape Karikari, v.1976, P. MacDonald, ED. Paratypes, Bay of Islands, Napia Bay, (35°10′S, 174°03′E), 6.iii.1975, in rock crevice at high water mark, J. M. Gurr, 2, AM.

Acknowledgements. I am indebted to Dr. G. Kuschel of the Entomology Division, D.S.I.R., and Mr K. A. J. Wise of the Auckland Institute and Museum for the opportunity to examine the material described above.

Errata. In Britton (1973) p. 121, line 15, for 1.55:1 read 1.45:1 and line 22, for 1.5:1 read 1.7:1 and for 1.6:1 read 1.55:1.

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1971 A new intertidal beetle (Coleoptera: Limnichidae) from the Great Barrier Reef. *J. Ent.* (B) 40 (2): 89-91, 1 pl., 5 figs.

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THE TAXONOMY OF SOME MOLLUSCAN SPECIES REPORTED FROM NEW ZEALAND

W. O. Cernohorsky

AUCKLAND INSTITUTE AND MUSEUM

Abstract. Type specimens of 16 species living in New Zealand are illustrated and their taxonomy is discussed. Species reported from New Zealand have been assigned in synonymy with some species from elsewhere: *Labio concolor* A. Adams = the European *Monodonta lineata* (da Costa); *Vitularia candida* H. & A. Adams = the South African *Trophon wahlbergi* (Krauss); *Fusus cinnamomeus* Reeve = the South African *Fasciolaria lugubris* Reeve. *Glaphyrina caudata* (Quoy & Gaimard) is an earlier name for the New Zealand fasciolarid *G. vulpicolor* (Sowerby), and *Latirus decoratus* A. Adams, is a tropical Indian Ocean *Peristernia*.

During a recent visit to the British Museum (Natural History), London, the opportunity was taken to examine and photograph some type-specimens of species described from New Zealand. Previous workers who have reported upon type-specimens of molluscan species in the British Museum (Nat. Hist.), are Fleming (1951) and Dell (1963).

Family TROCHIDAE

Subfamily Monodontinae Gray, 1857

The authorship of the subfamily name Monodontinae has been credited to "Cossmann 1916" in recent malacological literature, however, Gray (1857) established the subfamily several years earlier and also created as a synonym Canthiridinae Gray 1857. In the same publication Gray *(op. cit.)* established the subfamily Angariinae, which has up till now been credited to "Thiele 1924".

Monodonta lineata (da Costa, 1778) (Fig. 1)

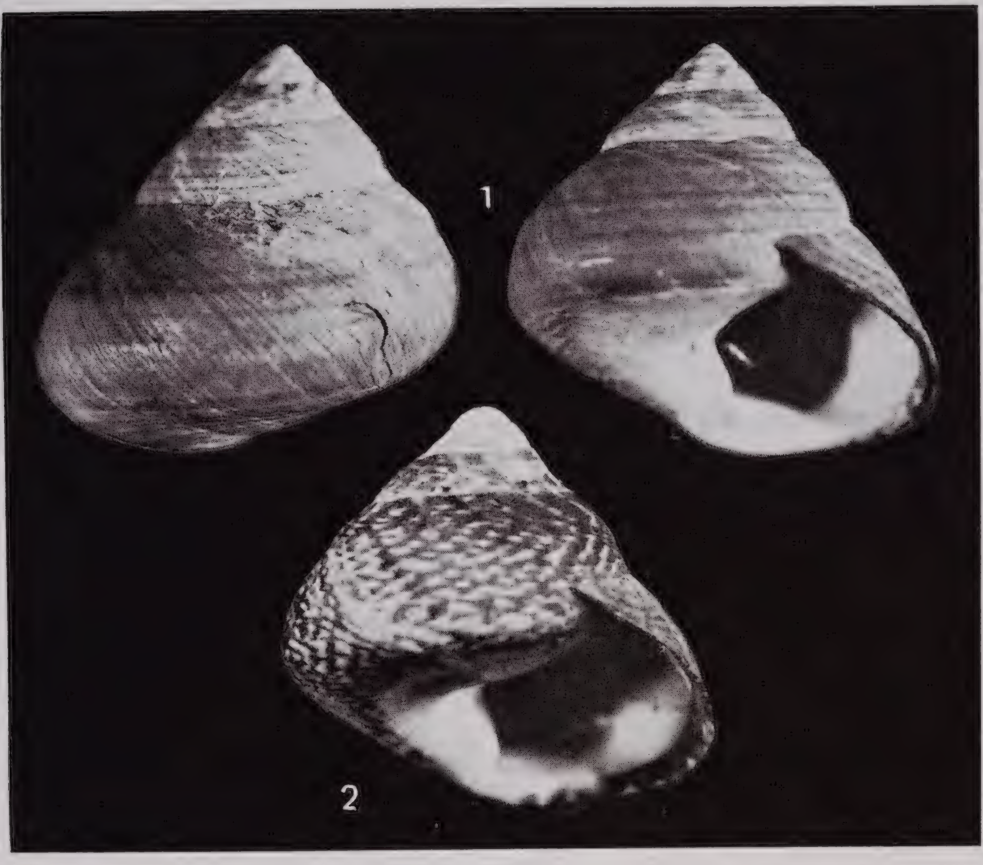
1778. *Turbo lineatus* da Costa, Brit. Conch. p. 100, pl. 6, fig. 7.

1853. *Labio concolor* A. Adams, Proc. Zool. Soc. Lond. Pt. 19: 180; 1915 Iredale, Trans. Proc. N.Z. Inst. 47: 437.

TYPE LOCALITY. Plymouth, England *(lineatus);* New Zealand = error *(concolor).*

Type specimens. Three syntypes of *L. concolor* are in the B.M.(N.H.), No. 196881, dimensions of illustrated syntype height 19.5 mm, width 20.6 mm.

Suter (1913) placed *M. concolor* in synonymy with the New Zealand species *M. aethiops* (Gmelin, 1791), whereas Iredale (1915), who examined the type-specimens of *M. concolor,* pointed out that the New Zealand locality is incorrect and that the species is a synonym of the European *M. lineata* (da Costa, 1778). The tubercular



Figs. 1, 2. *Monodonta lineata* (da Costa). 1. Syntype of *Labio concolor* A. Adams, BMNH No. 196881; 19.5 x 20.6 mm. 2. Specimen of *M. lineata* from Guernsey, Channel Is; 18.0 x 18.4 mm.

swelling on the columella and narrow umbilical fissure are features found in *M. lineata* but not in either of the New Zealand species *M. aethiops* (Gmelin) or *Diloma subrostrata* (Gray). *M. concolor* also lacks the oblique, striate or pitted spiral grooves of *M. aethiops*. Specimens of *M. lineata* from Guernsey, Channel Is, closely resemble *M. concolor* (A. Adams) (Fig. 2).

Genus **Diloma** Philippi, 1847

Subgenus **Fractarmilla** Finlay, [1927]

Diloma (Fractarmilla) subrostrata (Gray in Yate, 1835) (Fig. 3-5)

1835. *Monodonta subrostrata* Gray in Yate, Account of N.Z. p. 308; 1843 Gray in Dieffenbach, Travels in N.Z. 2: 238.

1853. *Labio corrosa* A. Adams, Proc. Zool. Soc. Lond. Pt. 19: 180.

1853. *Chlorostoma undulosum* A. Adams, Proc. Zool. Soc. Lond. Pt. 19: 182; 1946 Powell, Rec. Auckland Inst. Mus. 3 (2): 137.

1854. *Trochus attritus* Rousseau, Voy. Pole Sud 5: 57, pl. 14, figs. 19, 20.

1873. *Labio hectori* Hutton, Cat. Mar. Moll. N.Z. p. 37.

1883. *Diloma undulosa* Adams, Hutton, Trans. Proc. N.Z. Inst. 15: 125, pl. 15, fig. c (radula).

1883. *Diloma corrosa* Adams, Hutton, Trans. Proc. N.Z. Inst. 15: 126, pl. 15, fig. d (radula).

1883. *Diloma plumbea* Hutton, Trans. Proc. N.Z. Inst. 15: 126, pl. 15, fig. e (radula).

[1927]. *Zediloma (Fractarmilla) subrostrata* (Gray), Finlay, Trans. Proc. N.Z. Inst. 57: 352.

[1927]. *Zediloma (Fractarmilla) corrosa* A. Ad., Finlay, Trans. Proc. N.Z. Inst. 57: 352.

TYPE LOCALITY. E. coast of New Zealand *(M. subrostrata);* New Zealand *(L. corrosa; C. undulosum; T. attritus);* W. coast of the South I. *(L. hectori);* Sumner and the Ocean Beach, Dunedin (*D. plumbea).*

Type specimens. The following type-specimens are in the B.M.(N.H.), London: four syntypes of *M. subrostrata* Gray, No. 1952.10.29.16-19, dimensions of illustrated syntype height 12.7 mm, width 14.3 mm; the syntypes are spirally corded, white with dark brown axial stripes and spots on cords, and the occasional syntype is very dark (Fig. 3).

Three syntypes of *L. corrosa* A. Adams, No. 196880, dimensions of illustrated syntypes, ventral view height 15.3 mm, width 14.4 mm, dorsal view height 12.7 mm, width 13.5 mm (Fig. 4). This species is the type-species of *Fractarmilla* Finlay, [1927].

Three syntypes of *C. undulosum* A. Adams, No. 196883, dimensions of illustrated syntype, height 12.4 mm, width 16.7 mm. In its depressed shape and flamed colour pattern *C. undulosum* resembles some individuals of *D. (F.) subrostrata novazelandiae* (Anton, 1838) (Fig. 5).

Subgenus **Cavodiloma** Finlay, [1927]

Diloma *(*Cavodiloma) coracina (Philippi, 1851) (Fig. 6)

1851. *Trochus coracinus* Philippi, Syst. Conch.-Cab. Mart. & Chemnitz, ed. 2, 2 (3): 148, pl. 24, fig. 13.

1864. *Trochocochlea excavata* Adams & Angas, Proc. Zool. Soc. Lond. p. 37; 1880 Hutton, Man. N.Z. Moll. p. 97.

1883. *Diloma excavata* Adams, Hutton, Trans. Proc. N.Z. Inst. 15: 126, pl. 15, fig. F (radula).

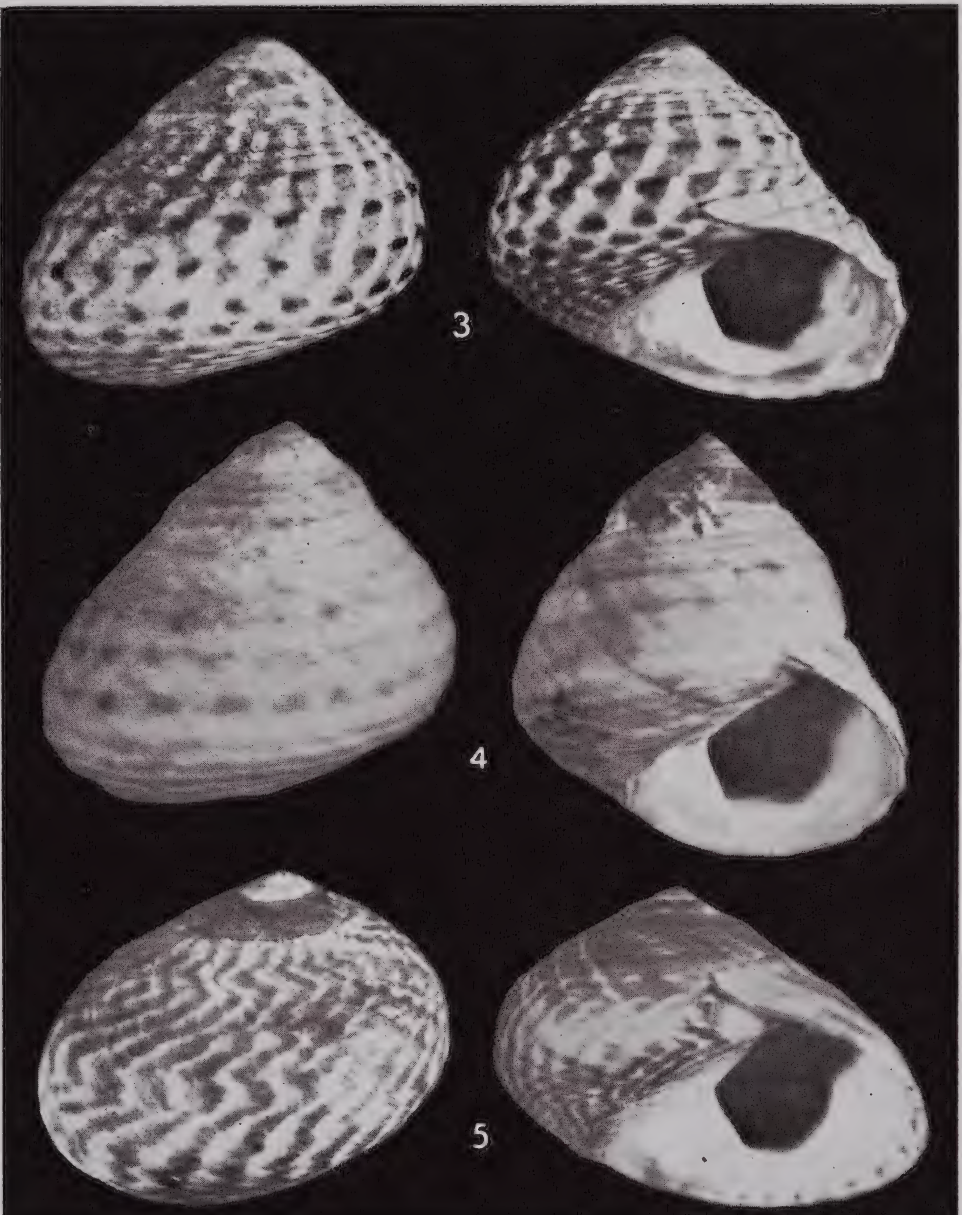
1897. *Monodonta coracina* (Trosch.), Suter, Proc. Malac. Soc. Lond. 2: 265; textfig. (radula).

1897. *Monodonta excavata* (Adams & Angas), Suter, Proc. Malac. Soc. Lond. 2: 265; 1913 Suter, Man. N.Z. Moll. p. 119; 1915 Suter, Atlas, pl. 38, fig. 9.

1927. *Cavodiloma coracina* (Philippi), Finlay, Trans. Proc. N.Z. Inst. 57: 353; 1961 Powell, Shells N.Z., ed. 4: 79, pl. 8, fig. 17.

TYPE LOCALITY. None *(T. coracinus);* New Zealand *(T. excavata).*

Type specimens. Eight syntypes of *D. (C.) excavata* (Adams & Angas) are in the B.M.(N.H.), No. 1870.10.26.151., dimensions of illustrated syntype, height 8.6 mm, width 7.4 mm. *D. (C.) excavata* is the type-species of *Cavodiloma* Finlay, [1927].



Figs. 3-5. *Diloma (Fractarmilla) subrostrata* (Gray in Yate). 3. Syntype BMNH No. 1952. 10.29.16., 12.7 x 14.3 mm. 4. Syntype of *Labio corrosa* A. Adams, BMNH No. 196880; dorsal view 12.7 x 13.5 mm, ventral view 15.3 x 14.4 mm. 5. Syntype of *Chlorostoma undulosum* A. Adams, BMNH No. 196883, 12.4 x 16.7 mm.

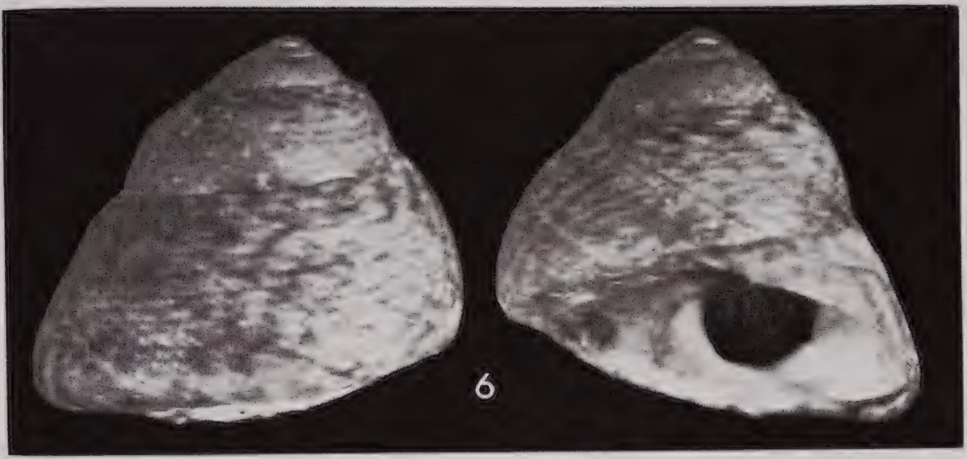


Fig. 6. *Diloma (Cavodiloma) coracina* (Philippi). Syntype of *Trochocochlea excavata* Adams & Angas, BMNH No. 1870.10.26.151.; 8.6 x 7.4 mm.

Genus **Cantharidus** Montfort, 1810

Subgenus **Plumbelenchus** Finlay, [1927]

Cantharidus (Plumbelenchus) capillaceus (Philippi, 1849) (Fig. 7, 8)

1849. *Trochus (Osilinus ?) capillaceus* Philippi, Zeit. f. Malakozool. 5 (7): 102 (ref. to Kuester, Conch. Cab., pl. 40, fig. 7) [published February 1849].

1849. *Trochus pruninus* Gould, Proc. Bost. Soc. Nat. Hist. 3: 90 (published March 1849); 1852 Gould, U.S. Expl. Exp. 12: 180, pl. 12, figs. 205a-b.

1851. *Trochus capillaceus* Philippi, Syst. Conch.-Cab. Mart. & Chemnitz, ed. 2, 2 (3): 275, pl. 40, fig. 7.

1853. *Canthiridis zealandicus* A. Adams, Proc. Zool. Soc. Lond. Pt. 19: 169.

1902. *Cantharidus pruninus minor* E. A. Smith, Rept. Coll. Nat. Hist. Voy. Southern Cross, p. 207.

1955. *Cantharidus (Plumbelenchus) capillaceus* (Philippi), Powell, Cape Exp. Ser. Bull. No. 15: 53; 1964 Dell, Rec. Dominion Mus. 4 (20): 279, fig. 7.

TYPE LOCALITY. New Holland = error (*C. capillaceus*); Auckland I (*C. pruninus*); New Zealand (*C. zealandicus*); Auckland Is, 10 fathoms (18 m) [*C. minor*].

Type specimens. Three syntypes of *C. (P.) zealandicus* (A. Adams) are in the B.M.(N.H.), No. 196849, size of illustrated syntype height 27.0 mm, width 19.0 mm. The species is conspecific with *C. (P) capillaceus* (Philippi) and not *C. opalus* (Martyn, 1784) as suggested by Suter (1913).

The date of description of *C. (P.) capillaceus* is usually given as 1848, but the correct date is *post* 30th January 1849. On the last page of Philippi's article (1849) are two notices to subscribers, one of which is dated 30th January 1849.

Dell (1964) discussed the *Cantharidus (Plumbelenchus)* species from the Southern Islands of New Zealand and pointed out that *C. (P.) capillaceus* is relatively constant

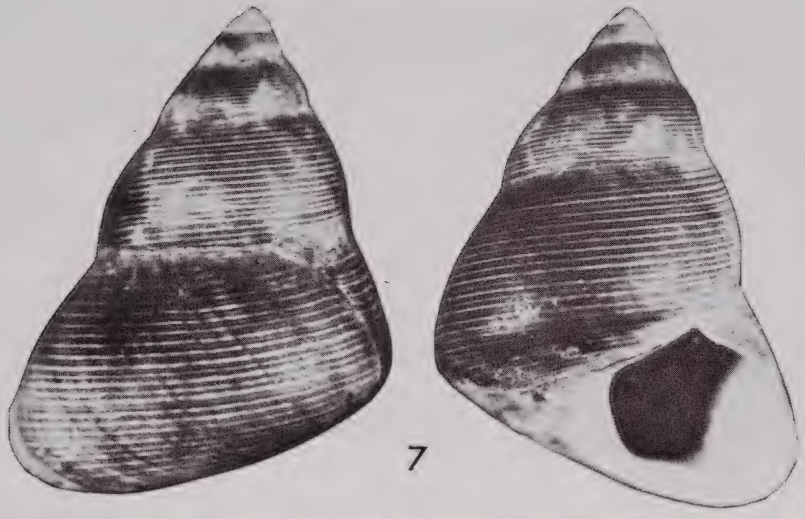


Fig. 7. *Cantharidus (Plumbelenchus) capillaceus* (Philippi). Syntype of *Cantharidis zealandicus* A. Adams, BMNH No. 196849; 27.0 x 19.0 mm.

in outline, that the width-index ratio (width expressed as a percentage of length) covers only a mere 5% (72%-77%), and concluded that no overlap in width-index ratio occurs between *C. (P.) capillaceus* from the Auckland and Campbell Is and the form from the Antipodes Is (width-index 79%-109%). The width-index of the Auckland-Campbell Is *capillaceus* was based on a very small sample of 8 specimens, which is far too small a sample to reflect the actual width-index range. We have increased the sample-size 22 times and this expanded the width-index of *capillaceus* to a range of 21% (67%-88%), with an overlap of 9% in the width-index range (79%-88%) between the Auckland-Campbell Is *capillaceus* and the population from the Antipodes Is (Fig. 8). A larger sample-size of the Antipodes Is *capillaceus* would most probably have expanded the 9% overlap in width-index.

The following mean width-index ratios show that the Campbell I population of *capillaceus* is slightly broader than the Auckland I one.

Auckland Is: Mean width-index of 106 specimens	75.6%
Campbell Is: Mean width-index of 68 specimens	79.4%
Antipodes Is: Mean width-index of 24 specimens	93.3%

Juvenile and immature specimens of Neogastropod species are usually considerably broader than adults and the same applies to the trochid *capillaceus*. We have divided our sample into 3 groups according to size, and expected to find the largest accumulation of juveniles in the 9.0 - 14.9 mm group, which indeed proved to be the case. The mean width-index of the 3 size groups is as follows:

9.0 - 14.9 mm group; mean width-index of 57 specimens	80.1%
15.0 - 19.9 mm group; mean width-index of 68 specimens	76.6%
20.0 - 29.0 mm group; mean width-index of 35 specimens	74.4%

The above analysis shows that the largest specimens of *capillaceus* are the most slender and the smallest are the broadest individuals in a given population.

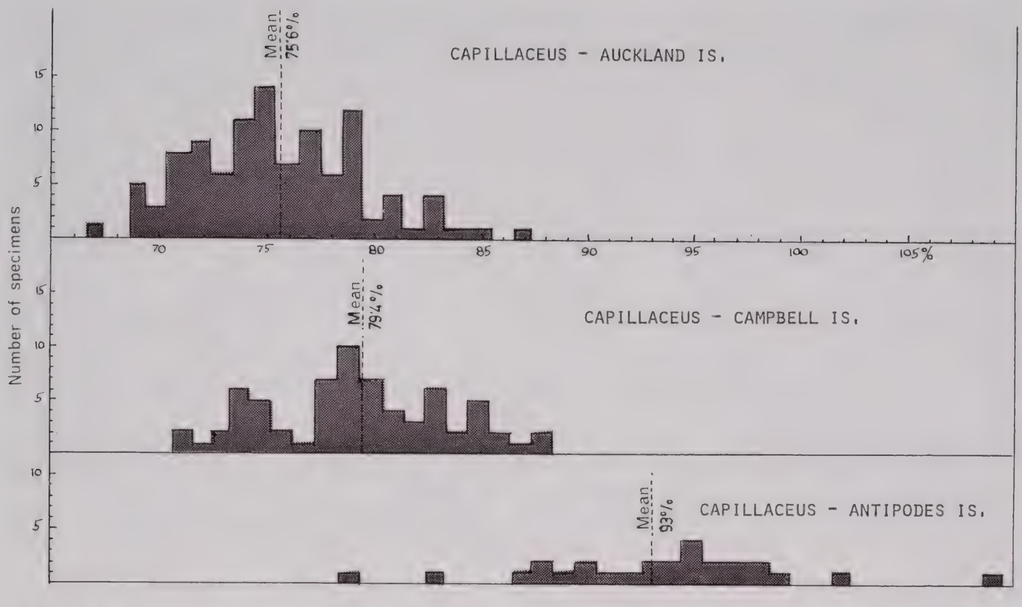


Fig. 8. Width-index—frequency histogram of *Cantharidus (Plumbelenchus) capillaceus* (Philippi) from Auckland Is, Campbell Is and Antipodes Is.

Subfamily CALLIOSTOMATINAE Thiele, 1924

Genus **Calliostoma** Swainson, 1840

Subgenus **Maurea** Oliver, 1926

Calliostoma (Maurea) spectabilis (A. Adams, 1855) (Fig. 9)

1855. *Zizyphinus spectabilis* A. Adams, Proc. Zool. Soc. Lond. Pt. 22: 37, pl. 27, fig. 7.

1897. *Calliostoma spectabile* (A. Adams), Suter, Proc. Malac. Soc. Lond. 2: 280; 1913 Suter, Man. N.Z. Moll. p. 147, pl. 40, fig. 5.

1926. *Calliostoma (Mauriella) spectabile* (A. Adams), Oliver, Proc. Malac. Soc. Lond. 7: 110.

[1927]. *Venustas (Mucrinops) spectabilis* A. Ad., Finlay, Trans. Proc. N.Z. Inst. 57: 360, pl. 18, fig. 26.

1950. *Venustas spectabile* (A. Adams), Dell, Rec. Dominion Mus., Zool. 1 (3-6): 45, figs. 16-18; 1955 Powell, Cape Exp. Ser. Bull. No. 15: 55.

TYPE LOCALITY. New Zealand.

Type specimen. The holotype is in the B.M.(N.H.), No. 1968150, height 50.5 mm, width 46.8 mm. The species is the type-species of *Mucrinops* Finlay [1927].

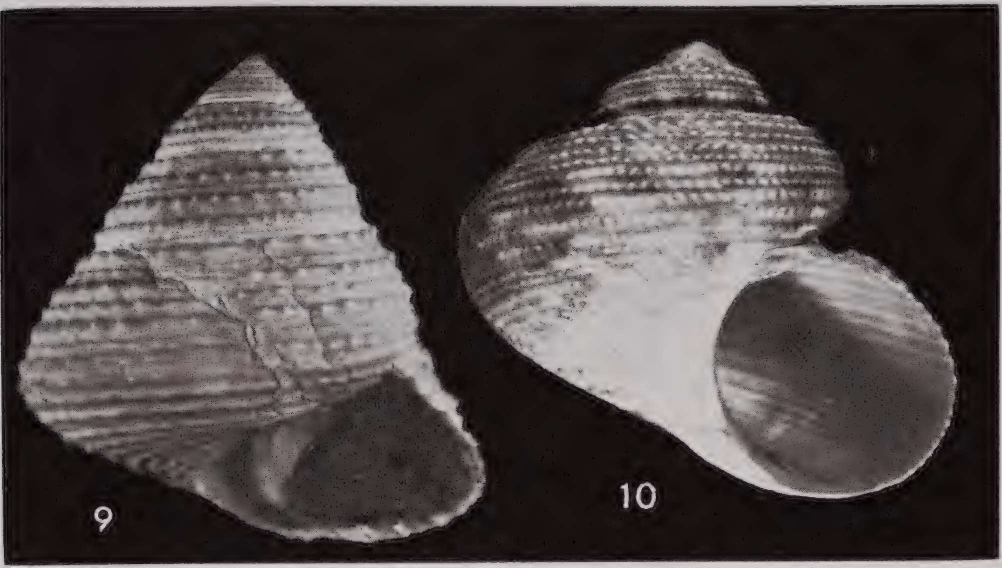


Fig. 9, 10. 9. *Calliostoma (Maurea) spectabilis* (A. Adams). Holotype BMNH No. 1968150; 50.5 x 46.8 mm. 10. *Turbo (Modelia) granosus* (Martyn). Syntype of *T. rubicundus* Reeve, BMNH No. 196845; 47.0 x 49.5 mm.

Family TURBINIDAE

Genus **Turbo** Linnaeus, 1758

Subgenus **Modelia** Gray, 1850

Turbo (Modelia) granosus (Martyn, 1784) (Fig. 10)

1781. *"Cochlea lunaris rubicunda"* Chemnitz, Syst. Conch. Cab. 5: 207, pl. 181, figs. 1803-04 (*non binom.*).

1784. *Trochus granosus* Martyn, Univ. Conch. 1: pl. 37 (*nom. conserv.*).

1789. *Cidaris rugosus* Roeding, Mus. Bolten. p. 84 (ref. to Chemnitz, *op. cit.*, pl. 181 fig. 1803 (in error figs. 1783, 1783) [*non Turbo rugosus* Linnaeus, 1767].

1802. *Turbo granosus* Holten, Enum. Syst. Conchyl. Chemnitzii, p. 69 (ref. to Chemnitz, *op. cit.*, figs. 1803-04 (in error 1804, 1804); 1913 Suter, Man. N.Z. Moll., p. 163; 1915 Suter, Atlas, pl. 40, fig. 8.

1842. *Turbo rubicundus* Reeve, Conch. Syst. 2: 168, pl. 220, figs. 11, 12.

1961. *Modelia granosa* (Martyn), Powell, Shells N.Z., ed. 4: 82, pl. 13, fig. 5.

TYPE LOCALITY. Coast of New Zealand (*T. granosus; T. rubicundus*).

Type specimens. The three syntypes of *Turbo rubicundus* Reeve, are in the B.M.(N.H.), No. 196845, dimensions of illustrated syntype, height 47.0 mm, width 49.5 mm.

Family NATICIDAE

Genus **Friginatica** Hedley, 1916

Friginatica amphiala (Watson, 1881) (Fig. 11)

1881. *Natica amphiala* Watson, J. Linn. Soc. Lond., Zool. 15: 260; 1886 Watson, Rept. Sci. Res. Voy. H.M.S. Challenger 15: 437, pl. 27, fig. 6.

1909. *Polinices (Lunatia) amphialus* (Watson), Suter, Subant. Islands N.Z. 1: 22.

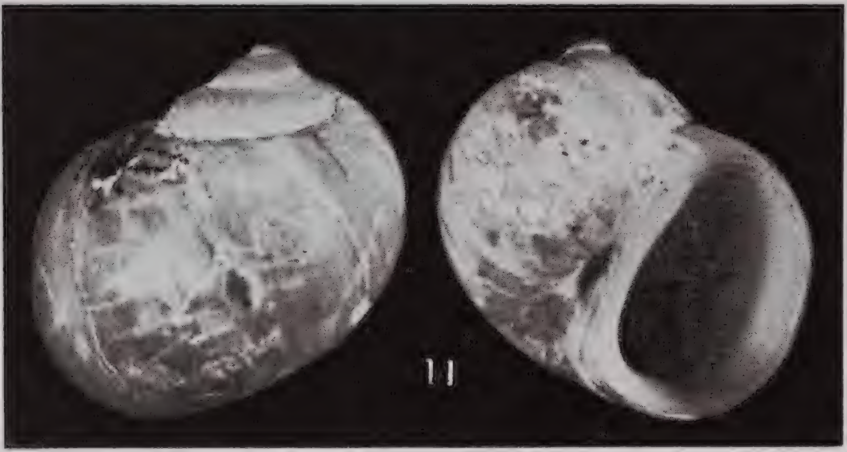


Fig. 11. *Friginatica amphiala* (Watson). Holotype BMNH, 7.0 x 6.3 mm.

1953. *Friginatica conjuncta* Dell, Rec. Dominion Mus. 2 (1): 43, fig. 8; 1956 Dell, Dominion Mus. Bull. No. 18: 73; 1961 Powell, Shells N.Z. ed. 4: 93.

1956. *Uberella amphiala* (Watson), Dell, Dominion Mus. Bull. No. 18: 76.

1961. *Uberella amphialis* (Watson), Powell, Shells N.Z., ed. 4; 93.

1963. *Friginatica amphiala* (Watson), Dell, Trans. R. Soc. N.Z. Zool. 3 (17): 175.

TYPE LOCALITY. N.E. from New Zealand, 700 fathoms (1280 m) [*F. amphiala*]; Chatham Rise, New Zealand *(F. conjuncta)*.

Type specimens. The holotype and 1 paratype are in the B.M.(N.H.), dimensions of holotype height 7.0 mm, width 6.3 mm; the shell is white under a brownish periostracum.

Family CYMATIIDAE

Genus **Cymatona** Iredale, 1929

Cymatona kampyla (Watson, 1883) (Fig. 12)

1883. *Nassaria kampyla* Watson, J. Linn. Soc. Lond., Zool. 16: 594; 1948 Tomlin, BANZARE Repts., ser. B, 5: 228, pl. 2, fig. 5.

1886. *Nassaria campyla* (*sic*) Watson, Rept. Sci. Res. Voy. H.M.S. Challenger 15: 405, pl. 14, fig. 12

1900. *Lampusia nodocostata* Tate & May, Trans. R. Soc. Sth. Aust. 24 (2): 90; 1901 Tate & May, Proc. Linn. Soc. N.S.W. 26 (3): 355, pl. 23, fig. 2.

1929. *Cymatona kampyla* (Watson), Iredale, Rec. Austral. Mus. 17 (4): 177.

1955. *Cymatona tomlini* Powell, Cape Exp. Ser. Bull. No. 15: 97 (*nom subst. pro Nassaria kampyla* Tomlin, 1948).

1956. *Cymatoma kampyla* (Watson), Dell, Dominion Mus. Bull. No. 18: 83, pl. 13, figs. 126, 132.

TYPE LOCALITY. Off Sydney, Australia, 410 fathoms (750 m) [*C. kampyla*]; East coast of Tasmania (*L. nodocostata*); off Lusitania Bay, Macquarie Is, 69 m (*C. tomlini*).

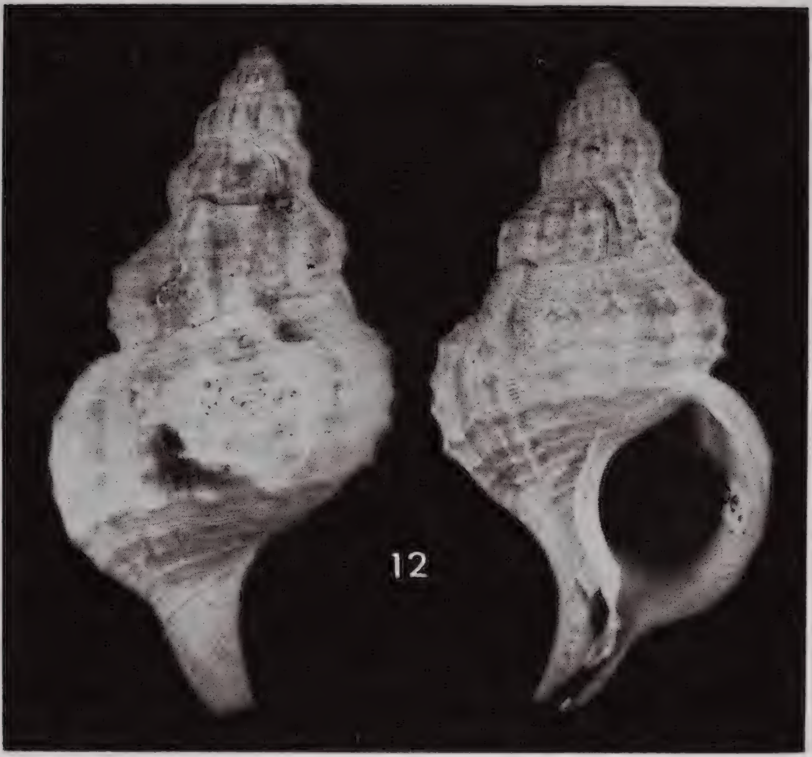


Fig 12. *Cymatona kampyla* (Watson). Holotype BMNH, 39.5 x 20.8 mm.

Type specimens. The holotype and 1 paratype are in the B.M.(N.H.), dimension of holotype length 39.5 mm, width 20.8 mm, height of aperture 22.7 mm.

C. kampyla has originally been described from off Sydney and has later been reported from Tasmania and from several New Zealand localities (Dell, 1956). Tomlin's (1948) record of *C. kampyla* from Macquarie I has been re-named *C. tomlini* Powell, 1955, but after examining the holotype of *C. tomlini,* I agree with Tomlin's suggestion that the Macquarie I record is *C. kampyla.* The short siphonal canal in the holotype of *C. tomlini* is not the result of natural growth but is clearly visible as having been broken off.

Family MURICIDAE

Genus **Trophon** Montfort, 1810

Trophon wahlbergi (Krauss, 1848) (Fig. 13)

1848. *Murex wahlbergi* Krauss, Suedafrik. Mollusk. p. 111, pl. 6, fig. 13; 1973 Kensley, Seashells Sth. Africa p. 140, fig. 477.

1864. *Vitularia candida* H. & A. Adams, Proc. Zool. Soc. Lond. for 1863: 430.

1880. *Trophon wahlbergi* Krauss, Tryon, Man Conch. 2: 147, pl. 31, fig. 315; 1971 Vokes, Bull. Americ. Paleont. 61 (268): 116.

1880. *Trophon walbergi* (*sic*) Krauss, Sowerby, Tes. Conchyl. 4: 63, pl. 405*, fig. 54.

1959. "*Murex*" *wahlbergi* Krss., Barnard, Ann. Sth. Afric. Mus. 45: 200, fig. 42c (protoconch).

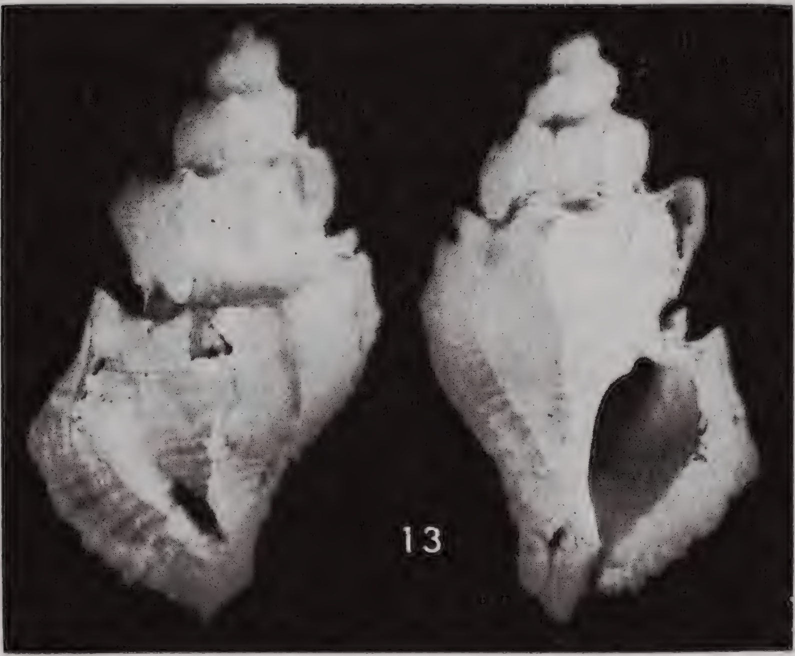


Fig. 13. *Trophon wahlbergi* (Krauss). Syntype of *Vitularia candida* H. & A. Adams, BMNH, 37.6 x 18.0 mm.

TYPE LOCALITY. Natal *(M. wahlbergi);* New Zealand = error *(V. candida).*

Type specimens. Three syntypes of *Vitularia candida* are in the B.M.(N.H.), dimensions of illustrated syntype length 37.6 mm, width 18.0 mm; faded white with traces of brown, outer lip with 8 plications.

Suter (1913) erroneously placed *Vitularia candida* in the synonymy of the New Zealand *Xymene ambiguus* (Philippi, 1844), while Finlay (1927) stated that the types, according to Iredale, prove to be of American and not New Zealand origin. The latter conclusion appears also erroneous as the syntypes of *V. candida* are faded and somewhat worn individuals of the South African *Trophon wahlbergi* (Krauss, 1848). The generic allocation of *wahlbergi* is still in doubt.

Genus **Xymene** Iredale, 1915

Xymene ambiguus (Philippi, 1844) (Fig. 14)

1844. *Fusus ambiguus* Philippi, Abb. Beschr. Conchyl. 1: 107, pl. 1, fig. 2.

1847. *Fusus cretaceus* Reeve, Conch. Icon. 4: pl. 13, figs. 48a, b.

1880. *Trophon cretaceus* Reeve, Sowerby, Thes. Conchyl. 4: 63, pl. 404, figs. 9, 10.

1883. *Trophon ambiguus* Philippi, Hutton, Trans. Proc. N.Z. Inst. 16: 219; 1913 Suter, Man. N.Z. Moll p. 405, pl. 45, fig. 13.

[1927]. *Zeatrophon ambiguus* (Philippi), Finlay, Trans. Proc. N.Z. Inst. 57: 424.

1972. *Xymene ambiguus* (Philippi), Ponder, J. R. Soc. N.Z. 2 (4): 484, figs. 5/1-5.

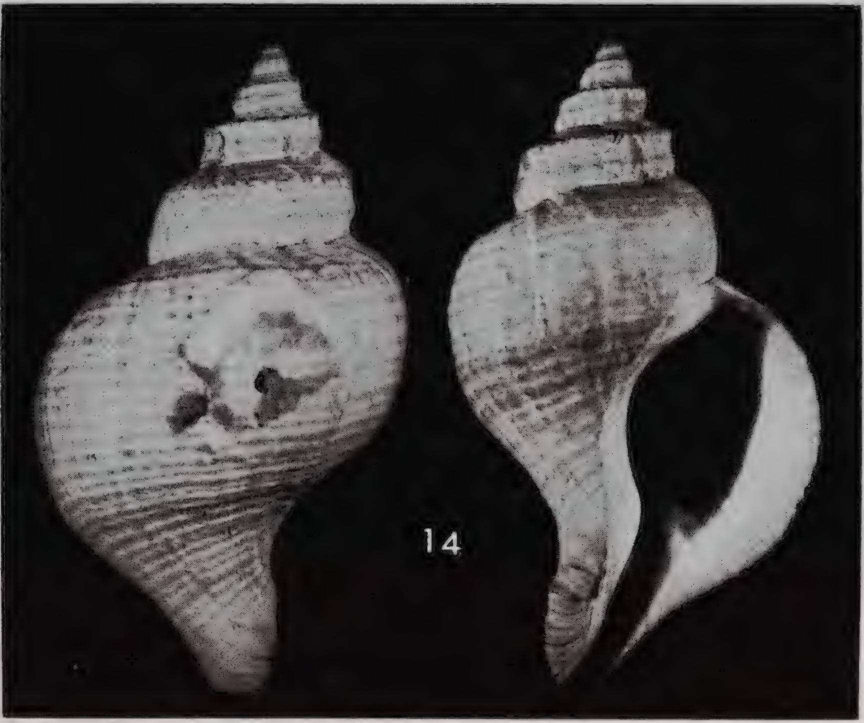


Fig. 14. *Xymene ambiguus* (Philippi). Syntype of *Fusus cretaceus* Reeve, BMNH, 51.9 x 29.0 mm.

TYPE LOCALITY. None *(F. ambiguus* and *F. cretaceus).*

Type specimen. One syntype of *Fusus cretaceus* Reeve (Cuming spec.) is in the B.M.(N.H.), length 51.9 mm, width 29.0 mm. The second syntype appears to have been sold in 1880 at auction of the Taylor collection.

Fusus ambiguus Philippi, is the type-species of *Zeatrophon* Finlay, [1927], a synonym of *Xymene* Iredale, 1915.

Genus **Paratrophon** Finlay, [1927]

Paratrophon quoyi (Reeve, 1846) (Fig. 15)

1853. *Purpura rugosa* Quoy & Gaimard, Voy. L'Astrolabe, 2: 569, pl. 38, figs. 19-21 (non Lamarck, 1822).

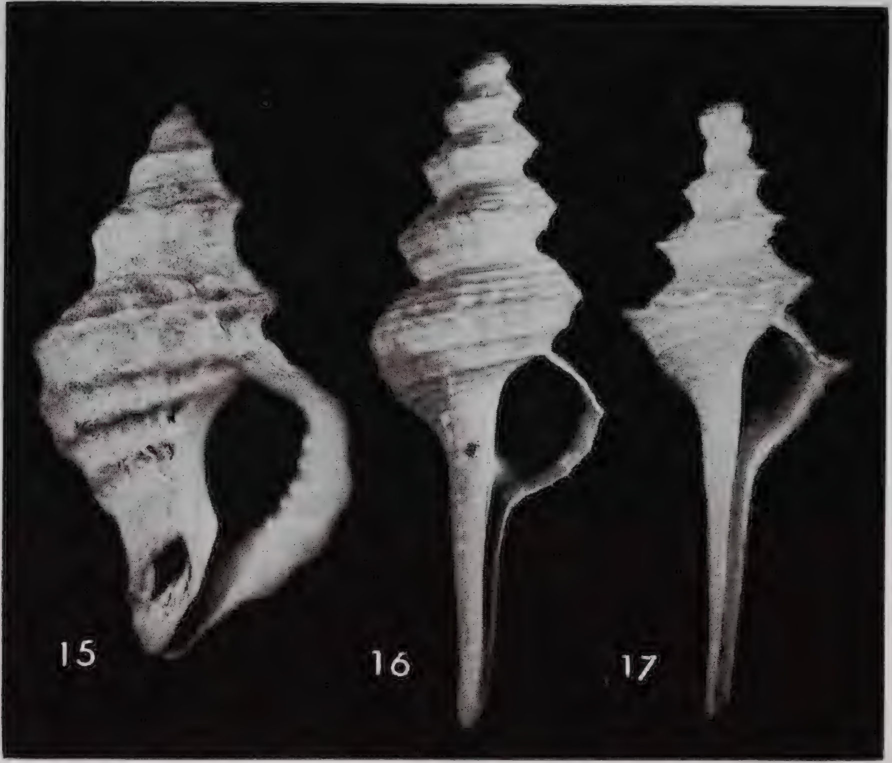
1846. *Purpura quoyi* Reeve, Conch. Icon. 3Lpl. 13, fig. 71.

1971. *Paratrophon quoyi quoyi* (Reeve), Ponder, J. Conchyl. 109 (3): 112, figs. 8-11, 13.

—— *Trophon stangeri auctt.* ? *non Fusus stangeri* Gray in Dieffenbach, 1843).

TYPE LOCALITY. Bay of Islands, New Zealand *(P. rugosa);* New Zealand *(P. quoyi).*

Type specimens. Two syntypes of *Purpura quoyi* Reeve, are in the B.M.(N.H.),



Figs. 15-17. 15. *Paratrophon quoyi* (Reeve). Syntype BMNH No. 1842.11.6.143., 27.5 x 15.2 mm. 16, 17. *Coluzea spiralis* (A. Adams). 16. Holotype BMNH No. 1951.10.16.1., 60.0 x 21.4 mm. 17. Holotype of *Columbarium suteri* E. A. Smith, BMNH No. 1915.4.18. 255.; 17.0 x 6.0 mm.

No. 1842.11.6.143-144., dimensions of illustrated syntype length 27.5 mm, width 15.2 mm.

Fusus stangeri Gray in Dieffenbach remains, in the absence of a type-specimen, a *nomen dubium*.

Family COLUMBARIIDAE

Genus **Coluzea** Finlay, [1927]

Coluzea spiralis (A. Adams, 1856) (Fig. 16, 17)

1856. *Fusus spiralis* A. Adams, Proc. Zool. Soc. Lond. Pt. 23: 221.

1873. *Fusus pensum* Hutton, Cat. Mar. Moll. N.Z. p. 8

1913. *Fusinus spiralis* A. Adams, Suter, Man. N.Z. Moll. p. 357, pl. 41, fig. 4.

1915. *Columbarium suteri* E. A. Smith, Brit. Ant. Terra Nova Exp. 2: 87, pl. 1, fig. 30, (juvenile).

[1927]. *Coluzea spiralis* A. Ad., Finlay, Trans. Proc. N.Z. Inst. 57: 407; 1927 Powell, Trans. Proc. N.Z. Inst. 58: 298, pl. 34, fig. 3 (protoconch); 1930 Finlay, Trans. Proc. N.Z. Inst. 61: 268.

1956. *Coluzea spiralis* (A. Adams), Dell, Rec. Dominion Mus. 3 (1): 47.

TYPE LOCALITY. New Zealand *(F. spiralis)*; Kapiti, Cook Strait *(F. pensum)*; near Nth. Cape, 11-20 fathoms (20-37 m) [*C. suteri*].

Type specimens. The holotype of *Fusus spiralis* A. Adams, is in the B.M.(N.H.), No. 1951.10.16.1., length 60.0 mm, width 21.4 mm. The holotype of *Columbarium suteri* E. A. Smith (= juvenile of *C. spiralis*), is in the same Institution No. 1915.4.18.255., length 17.0 mm, width 6.0 mm.

Family BUCCINIDAE

Genus **Buccinulum** Deshayes, 1830

Buccinulum vittatum (Quoy & Gaimard, 1833) (Fig. 18)

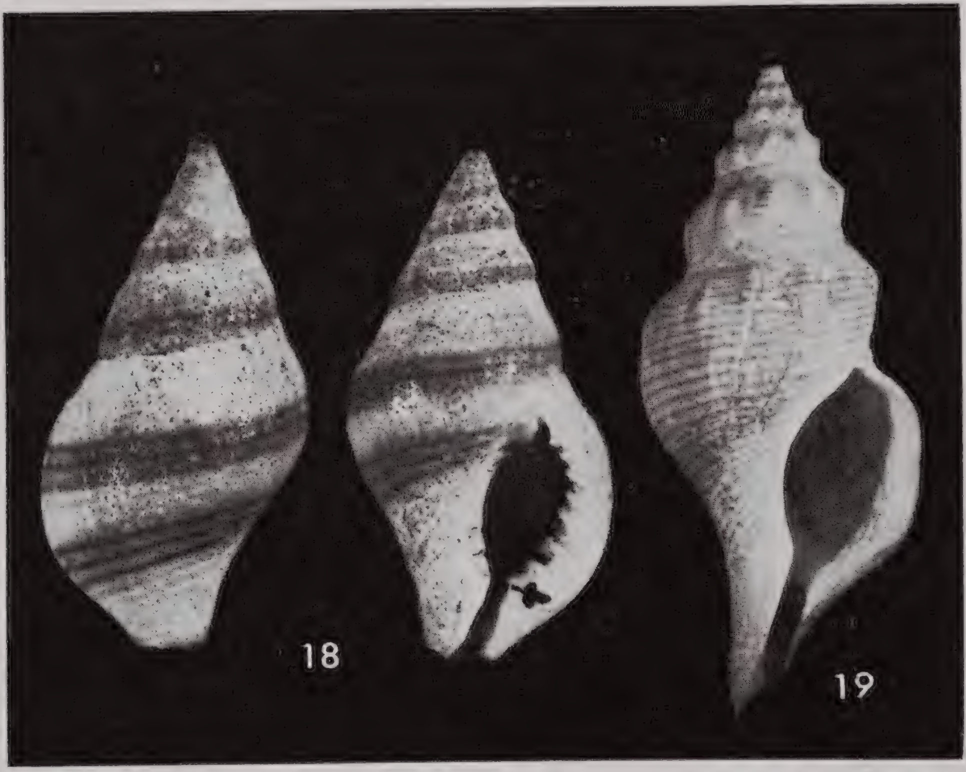
1833. *Fusus vittatus* Quoy & Gaimard, Voy. L'Astrolabe 2: 504, pl. 34, figs. 18, 19.

1846. *Buccinum trilineatum* Reeve, Conch. Icon. 3: pl. 12, fig. 98.

1971. *Buccinulum vittatum vittatum* (Quoy & Gaimard), Ponder, J. R. Soc. N.Z. 1 (3/4): 248, figs. 6/1-15; 7/1-16.

TYPE LOCALITY. Bay of Islands, New Zealand *(F. vittatus)*; None *(B. trilineatum)*.

Type specimens. Three worn syntypes of *B. trilineatum* Reeve, are in the B.M.(N.H.), No. 1844.5.30.26., dimensions of illustrated syntype length 17.3 mm, width 8.8 mm. *B. trilineatum* Reeve, is a synonymy of *Buccinulum vittatum* (Quoy & Gaimard).



Figs. 18, 19. 18. *Buccinulum vittatum* (Quoy & Gaimard). Syntype of *Buccinum trilineatum* Reeve. BMNH No. 1844.5.30.26.; 17.3 x 8.8 mm. 19. *Aeneator valedictus* (Watson). Holotype BMNH No. 1887.2.9.696., 81.3 x 21.4 mm.

Genus **Aeneator** Finlay, [1927]

Aeneator valedictus (Watson, 1886) (Fig. 19)

1886. *Fusus valedictus* Watson, Rept. Sci. Res. Voy. H.M.S. Challenger, 15: 201, pl. 17, fig. 7.

1907. *Siphonalia valedicta* (Watson), Iredale, Trans. Proc. N.Z. Inst. 40: 383; 1913 Suter, Man. N.Z. Moll. p. 372, pl. 18, fig. 9; [1927] Finlay, Trans. Proc. N.Z. Inst. 57: 414.

1956. *Aeneator valedictus* (Watson), Dell, Dominion Mus. Bull. No. 18: 100, pl. 14, fig. 136.

TYPE LOCALITY. 200 mi. (371 km) W. of Cape Farewell, New Zealand, 275 fathoms (503 m).

Type specimen. The holotype is in the B.M.(N.H.), No. 1887.2.9.696., length 81.3 mm, width 21.4 mm; penultimate whorl with 17 spiral threads, periostracum yellowish-brown.

Family FASCIOLARIIDAE

Genus **Glaphyrina** Finlay, [1927]

Glaphyrina caudata (Quoy & Gaimard, 1833) (Fig. 20)

1833. *Fusus caudatus* Quoy & Gaimard, Voy. L'Astrolabe 2: 503; pl. 34, figs. 20, 21.

1880. *Neptunea caudata* Quoy & Gaimard, Hutton, Man. N.Z. Moll. p. 50.

1880. *Fusus vulpicolor* Sowerby, Thes. Conchyl. 4: 78, pl. 411, fig. 73.

1913. *Siphonalia caudata* Quoy & Gaimard, Suter, Man. N.Z. Moll. p. 371; 1915 Suter, Atlas, pl. 44, fig. 18.

1927. *Glaphyrina vulpicolor* Sowerby, Finlay, Trans. Proc. N.Z. Inst. 57: 414, pl. 21, fig. 80; 1961 Powell, Shells N.Z. ed. 4: 99, pl. 12, fig. 18.

TYPE LOCALITY. New Zealand *(F. caudatus);* New Zealand (in text) and Falkland Is = error (in plate expl.) [*F. vulpicolor*].

Type specimen. The holotype of *Fusus vulpicolor* Sowerby, is in the B.M.(N.H.), No. 1907.10.28.211., length 26.0 mm, width 11.6 mm. The locality "New Zealand" is appended in Sowerby's hand-writing.

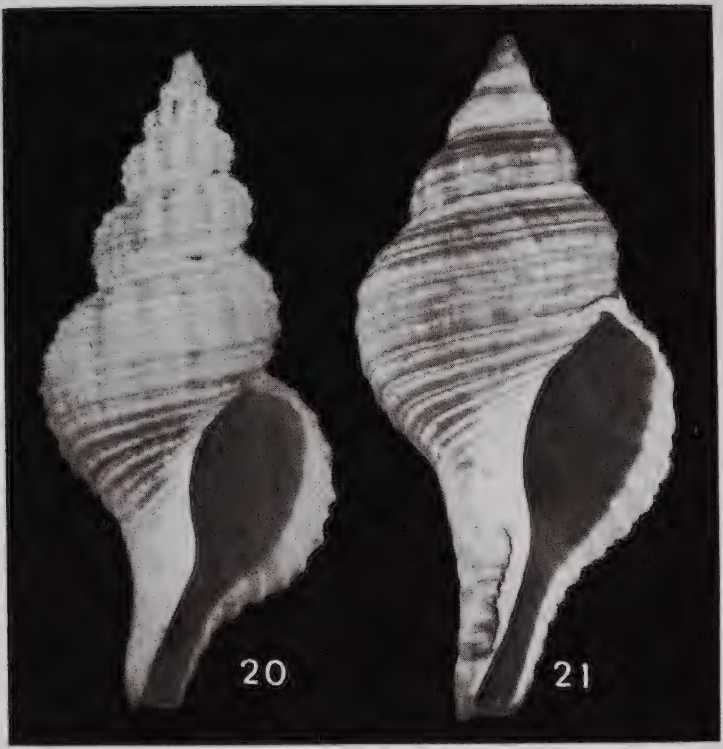
Finlay's (1927) reason for rejecting Quoy & Gaimard's species *Fusus caudatus* is somewhat obscure, especially his reference to Suter's figure *caudatus* representing *Fusus vulpicolor*. Quoy & Gaimard's (1832-33) locality for *F. caudatus* has been given correctly as New Zealand, the description is good and the figures are excellent, leaving no doubt that *F. caudatus* and *F. vulpicolor* are conspecific and that the species could not be confused with any other similar New Zealand species. The earliest name *Glaphyrina caudata* (Quoy & Gaimard, 1833) should be restored for this New Zealand fasciolarid species.

Fusus vulpicolor Sowerby, is the type-species of *Glaphyrina* Finlay [1927].

Genus **Fasciolaria** Lamarck, 1799

Fasciolaria lugubris Reeve, 1847 (Fig. 21)

1847. *Fasciolaria lugubris* Reeve, Conch. Icon. 4: pl. 1, figs. 2a, b (October, 1847); 1959 Barnard, Ann. Sth. Afric. Mus. 45: 76, figs. 18b, c (protoconch); figs. 19a, b (radula); 1973 Kensley, Sea-shells Sth. Africa p. 164, fig. 609.



Figs. 20, 21. 20. *Glaphyrina caudata* (Quoy & Gaimard). Holotype of *Fusus vulpicolor* Sowerby, BMNH No. 1907.10.28.211.; 26.0 x 11.6 mm. 21. *Fasciolaria lugubris* Reeve. Holotype of *Fusus cinnamomeus* Reeve, BMNH No. 1879.2.26.104.; 55.3 x 26.0 mm.

1847. *Fusus cinnamomeus* Reeve, Conch. Icon. 4: pl. 5, fig. 16 (November 1847).
1848. *Fasciolaria badia* Krauss, Suedafrik. Mollusk. p. 110, pl. 6, fig. 12.
1848. *Fusus mandarinus* Duclos, Krauss, Suedafrik. Mollusk. p. 110 (*non* Duclos, 1832).
1880. *Fusus cinnamoneus* (*sic*) Reeve, Sowerby, Thes. Conchyl. 4: 83. pl. 411, fig. 65.
1932. *Fasciolaria agulhasensis* Tomlin, Ann. Sth. Afric. Mus. 30 (2): 11, fig. 1.

TYPE LOCALITY. Cape of Good Hope *(F. lugubris);* None *(F. cinnamomeus);* Natal *(F. badia);* Agulhas Bank, 28 fathoms (51 m) [*F. agulhasensis*].

Type specimen: The holotype of *Fusus cinnamomeus* Reeve, is in the B.M.(N.H.), No. 1879.2.26.104., length 55.3 mm, width 26.0 mm.

Originally described from unknown locality, Sowerby (1880) localized the species from the Cape of Good Hope. Suter (1913) synonymized *Fusus cinnamomeus* with the New Zealand buccinid species "*Fusus mandarinus* Duclos, 1832" (= *Penion sulcatus* Lamarck, 1816), while Krauss (1848) erroneously reported the Australian *Penion mandarinus* (Duclos, 1832) from South Africa. The South African fasciolarid *Fasciolaria lugubris* Reeve, and the New Zealand buccinid *Penion sulcatus* (Lamarck), are sometimes closely similar in appearance. We agree with Sowerby (1880) that the type of *Fusus cinnamomeus* originated from South Africa, and consider the species a synonym of the South African *Fasciolaria lugubris* Reeve, 1847.

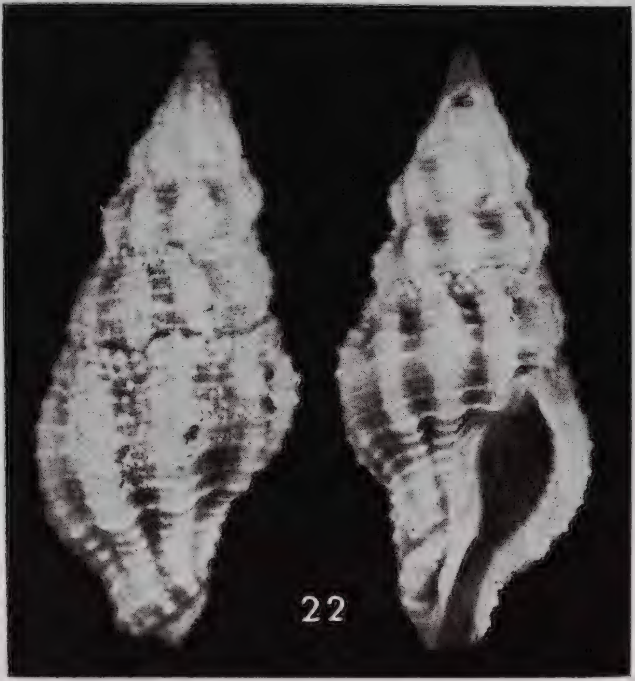


Fig. 22. *Peristernia decorata* (A. Adams). Syntype BMNH No. 1968454. 18.2 x 7.8 mm.

Genus **Peristernia** Moerch, 1852

Peristernia decorata (A. Adams, 1855) (Fig. 22)

1855. *Latirus decoratus* A. Adams, Proc. Zool. Soc. Lond. Pt. 22: 316; 1879 E. A. Smith, Proc. Zool. Soc. Lond. for 1878: 812, pl. 50, fig. 11.

TYPE LOCALITY. New Zealand = error.

Type specimens. Two syntypes are in the B.M.(N.H.), No. 1968454, dimensions of illustrated syntype length 18.2 mm, width 7.8 mm; there are 9 broad axial ribs on the penultimate and the same number on the body whorl, spiral cords override axial ribs, sutures with 2 prominently granulose spiral cords, columella with 3 basal denticles, aperture lirate, pinkish-white in colour and brown between axial ribs.

The species does not live in New Zealand and has been subsequently reported by E. A. Smith (1879) from the Andaman Islands.

Acknowledgements. I would like to thank Dr J. Taylor and Ms K. Way, British Museum (Natural History), London, for access to the Museum's type collection. To my colleague Dr A. W. B. Powell, I am grateful for his opinions and discussions concerning New Zealand species here treated.

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1832-33 *Voyage de découvertes de L'Astrolabe exécuté par ordre du Roi, pendant les années* 1826-1829, *sous le commandement de M. J. Dumont D'Urville.* Paris, J. Tastu 2: 1-674; Atlas, Moll. pl. 30-39.

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1879 On a collection of marine shells from the Andaman Islands. *Proc. Zool. Soc. London* for 1878: 804-821; pl. 50.

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1880 *Thesaurus Conchyliorum, or figures and descriptions of Recent Shells . . . genera Trophon, Fusus, Pyrula and Ficula.* London, Sowerby 4 (35-36): 59-110; pl. 404-423.

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1913-15 *Manual of the New Zealand Mollusca. with an Atlas of Quarto plates.* Wellington, John Mackay, pp. 1-1120 (1913); pl. 1-72 (1915).

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THE TAXONOMY OF SOME SOUTHERN OCEAN MOLLUSCA (GASTROPODA) MAINLY ANTARCTIC AND SUBANTARCTIC

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Abstract. One Antarctic and six Subantarctic molluscan specific names are primary homonyms and are taxonomically not available. *Calliotropis pelseneeri* and *Pareuthria powelli* are here proposed as substitute names. The type-specimens of 14 Southern Ocean Mollusca are illustrated. The following taxonomic corrections have been made: *Fusitriton magellanicus* (Roeding, 1798) for *F. cancellatum* (Lamarck, 1816); *Trophon plicatus* (Solander in Lightfoot, 1786) for *T. lamellosus* (Gmelin, 1791) [= *laciniatus* auctt.]; and *Acanthina monodon* (Pallas, 1774) for *A. monodon* (Solander in Lightfoot, 1786) [= *calcar* auctt.].

The purpose of this paper is to draw attention to seven homonymous scientific names, which over the years, have become entrenched in Antarctic-Subantarctic malacological literature and to illustrate some of the type specimens. Some of the specific synonymies have been abridged and for a more expanded synonymy and more detailed information on some of the species see Powell (1951; 1957; 1958; 1960) and Dell (1971; 1972).

Family TROCHIDAE

Genus **Solariella** S. V. Wood, 1842

Solariella infundibulum (Watson, 1879) (Fig. 1)

1879. *Trochus (Margarita) infundibulum* Watson, J. Linn. Soc. Lond., Zool. 14: 707; 1886 Watson, Rept. Sci. Res. Voy. H.M.S. Challenger 15: 84, pl. 5, fig. 5.

1889. ? *Solariella infundibulum* (Watson), Dall. Bull. Mus. Comp. Zool. Harvard 18: 380.

1960. *Calliotropis infundibulum* (Watson), Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 130.

1962. *Calliotropis infundibula* (Watson), Clarke, Nat. Mus. Canada Bull. No. 181: 9.

1974. ? *Solariella infundibulum* (Watson), Abbott, Americ. Seashells, ed. 2: 41, fig. 287.

TYPE LOCALITY. Marion I [Prince Edward Is], 1375 fathoms (2515 m) [here designated].

Type specimen. The original type-series of *S. infundibulum* contained 2 immature specimens from 1075 fathoms (1966 m) from Bermuda and 5 specimens from Marion I, Prince Edward Is (Watson, 1897). From the 5 specimens, 3 were preserved with the animal in spirits and 2 were dry. The two dry syntypes are in the B.M. (N.H.), No. 1887.2.9.328-29., labelled "off Marion I, 1375 fathoms". The specimen marked as the holotype, dimensions length 15.3 mm, width 15.3 mm, is illustrated (Fig. 1).

Some doubt exists that Watson's 2 immature specimens from Bermuda are conspecific with *S. infundibulum* from Marion I, although specimens from both areas are very similar.

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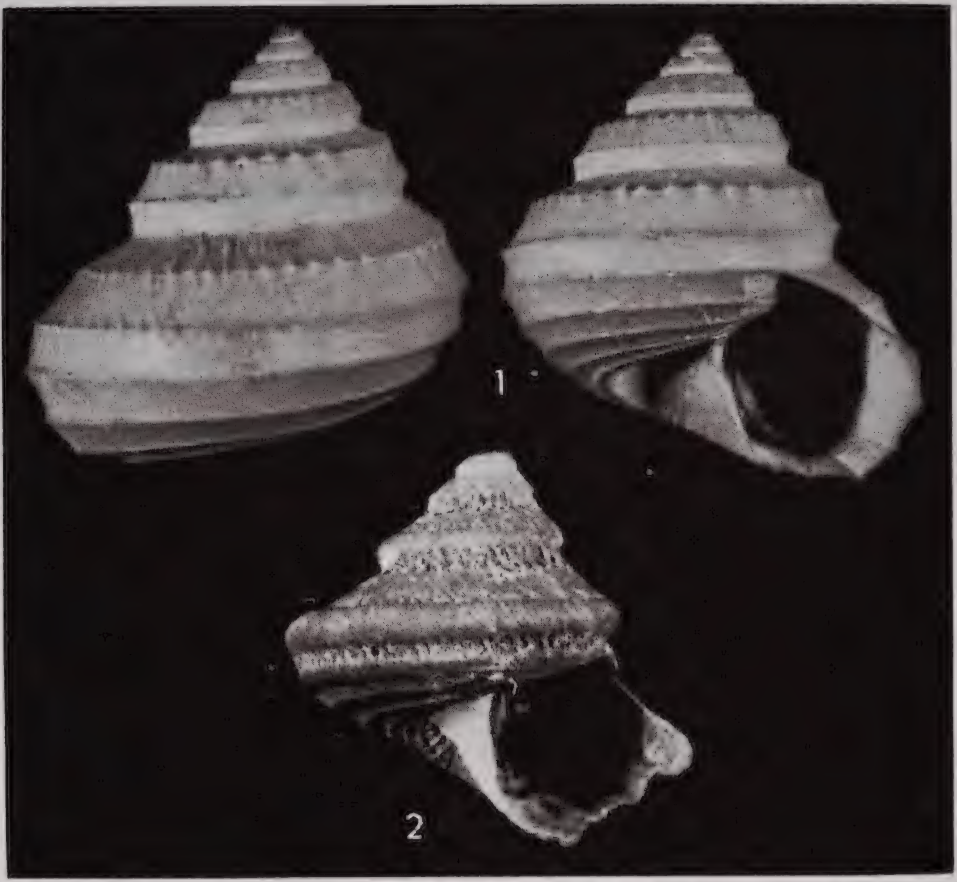


Figs 1, 2. 1. *Solariella infundibulum* (Watson). Off Marion I; holotype BMNH No. 1887.29.328., 15.3 x 15.3 mm. 2. *Calliotropis pelseneeri* nom. n. Off Kemp Land, Antarctic, 603 m; length 105 mm.

Genus **Calliotropis** Seguenza, 1903

Calliotropis pelseneeri nom. n. (Fig. 2)

1903. *Margarita lamellosa* Pelseneer, Res. Voy. S. Y. Belgica, Zool. p. 18, pl. 5, fig. 47 [*non Margarita lamellosa* Verill & Smith, 1880, Trans Conn. Acad. 5: 530, pl. 57, fig. 38].

1913. *Sollariellopsis ? lamellosa* (Pelseneer), Thiele, Deut. Suedpol.-Exp. 13: 187, pl. 11, fig. 12.

1958. *Calliotropis lamellosa* (Pelseneer), Powell, B.A.N.Z. Ant. Res. Exp. Ref. (B) 6 (9): 182; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 130.

TYPE LOCALITY. Bellingshausen Sea.

Margarita lamellosa Pelseneer, 1903, is a primary homonym of *M. lamellosa* Verrill & Smith, 1880, which is a *Solariella* from the East coast of the U.S. and the West Indies. This distinctive and solitary Antarctic member of *Calliotropis* has no available synonyms and *C. pelseneeri* is here proposed as a substitute name.

Family NATICIDAE

Genus **Amauropsis** Moerch, 1857

Amauropsis suturalis (Watson, 1881) [*nom. praeocc.*]

1881. *Natica suturalis* Watson, J. Linn. Soc. Lond., Zool. 15: 257 [*non Natica suturalis* Gray, 1839; *nec* Forbes, 1846; *nec* Grateloup, 1847].

1886. *Natica (Amauropsis) suturalis* Watson, Rept. Sci. Res. Voy. H.M.S. Challenger 15: 455, pl. 27, fig. 4.

1957. *Amauropsis saturalis* (*sic*) Watson, Powell, B.A.N.Z. Ant. Res. Exp. Rep. (B) 6 (7) 129.

1960. *Amauropsis suturalis* (Watson), Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 144.

TYPE LOCALITY. Balfour Bay, Royal Sound, Kerguelen Land, 60 fathoms (110 m).

Natica suturalis Watson, 1881, is a primary homonym three times over. No substitute name is proposed because one of the several closely similar Antarctic *Amauropsis* species may qualify as a substitute name.

Subgenus **Kerguelenatica** Powell, 1951

Amauropsis (Kerguelenatica) delicatula (E. A. Smith, 1902)

1878. *Natica grisea* v. Martens, Sitz.-Ber. Ges. naturfr. Berlin, p. 24; 1903 Thiele, Wiss. Erg. deut. Tief. Exp. Valdivia 7: 164, pl. 8, fig. 44 (radula); 1915 E. A. Smith, Brit. Ant. Terra Nova Exp. Zool. Moll. 2 (4): 69 (placed his *N. delicatula* in synonymy); [non *Natica grisea* Requien, 1848, Cat. Coq. Corse, p. 61].

1902. *Natica delicatula* E. A. Smith, Rept. Coll. Nat. Hist. Voy. Southern Cross, pt. 7: 206, pl 24, fig. 6.

1916. *Friginatica grisea* v. Martens, Hedley, Aust. Ant. Exp., ser. C, 4 (1): 52.

1951. *Amauropsis (Kerguelenatica) grisea* (v. Martens), Powell, Discovery Repts. 26: 118, pl. 10, fig. 60; 1957 Powell, B.A.N.Z. Ant. Res. Exp. Rep. (B) 6 (7): 180; 1958 Powell, B.A.N.Z. Ant. Res. Exp. Rep. (B) 6 (9): 190; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 144; 1962 Clarke, Nat. Mus. Canada Bull. No. 181: 20; 1972 Arnaud, Tethys Suppl. 4: 125, fig. 16.

TYPE LOCALITY. Kerguelen Is *(A. grisea)*; Cape Adare, Victoria Land, 26 fathoms (48 m) [*A. delicatula*].

Natica grisea v. Martens, 1878, is a primary homonym of *N. grisea* Requien, 1848 (a form of the Atlantic-Mediterranean *N. intricata* Donovan, 1804), and the specific name will have to revert to *Amauropsis delicatula* (E. A. Smith, 1902), its junior synonym. The species is the type-species of the subgenus *Kerguelenatica* Powell.

Family CYMATIIDAE

Genus **Fusitriton** Cossmann, 1903

Fusitriton magellanicus (Roeding, 1798) (Fig. 3)

1788. *"Murex Magellanicus"* Chemnitz, Syst. Conchyl. Cab. 10: 275, pl. 164, fig. 1570 *(non binom.)*.

1791. *Murex magellanicus (pars)* var. b Gmelin, Syst. Nat. ed. 13: 3548 (ref. to Chemnitz, *op. cit.*, pl. 164, fig. 1570).

1798. *Neptunea magellanica* Roeding, Mus. Bolten. p. 116 (ref. to Chemnitz, *op. cit.*, pl. 164, fig. 1570).

1816. *Triton cancellatum* Lamarck, Tabl. Encyl. Méth. p. 4, pl. 415, fig. 1.

1886. *Triton (Lagena) magellanicus* Chemnitz, Watson, Rept. Sci. Res. Voy. H M.S. Challenger, 15: 395.

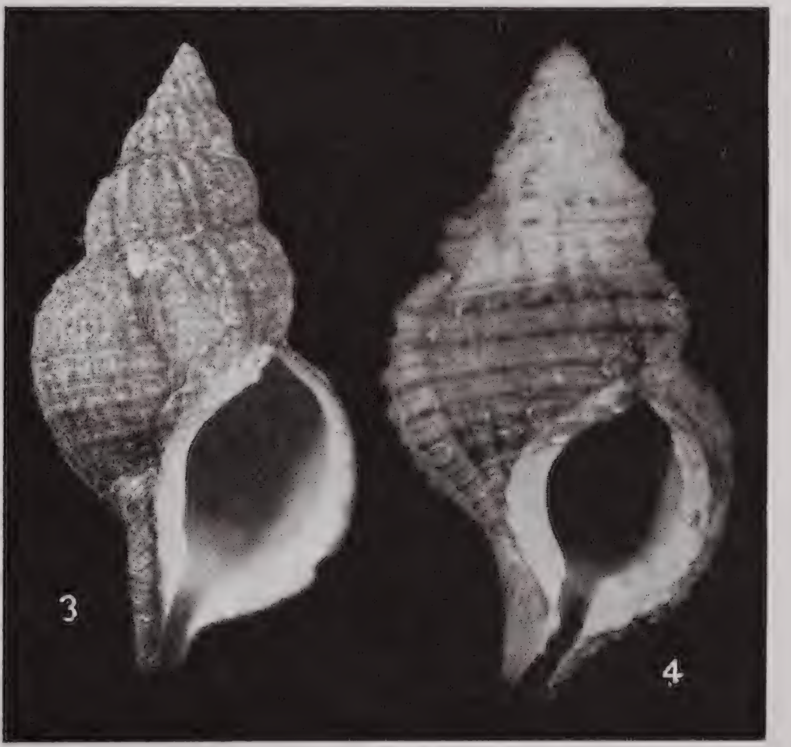
1903. *Tritonium magellanicum* Chemnitz, v. Martens, Wiss. Erg. deut. Tief. Exp. Valdivia. 7: 39.

1951. *Argobuccinum (Fusitriton) magellanicum* (Chemnitz), Carcelles & Williamson, Rev. Inst. Nac. Cienc. Nat. Mus. Argentino, 2 (5): 286.

1951. *Fusitriton cancellatum* (Lamarck), Powell, Discovery Repts. 26: 130; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 147.

TYPE LOCALITY. Coast of the Strait of Magellan (*F. magellanicus* — Chemnitz, 1788); Southern America (*T. cancellatum*)

Neptunea magellanica Roeding, 1798, will have to replace the non-binomial Chemnitz name, and at the same time has chronological priority over *Triton cancellatum* Lamarck, 1816.



Figs. 3, 4. 3. *Fusitriton magellanicus* (Roeding). W. of George I, E. Falkland Is, 129-137 m; length 93.5 mm. 4. *Cymatium (Septa) philomelae* (Watson). Nightingale I, Tristan da Cunha, 183-274 m; syntype BMNH No. 1887.2.9.1188., 27.0 x 15.0 mm.

Genus **Cymatium** Roeding, 1798

Subgenus **Septa** Perry, 1810

Cymatium (Septa) philomelae (Watson, 1881) (Fig. 4)

1881. *Triton philomelae* Watson, J. Linn. Soc. Lond., Zool. 15: 268.

1886. *Triton (Simpulum) philomelae* Watson, Rept. Sci. Res. Voy. H.M.S. Challenger, 15: 391, pl. 14, fig. 10.

1933. *Cymatium (Lampusia) philomelae* (Watson), C. Bayer, Zool. Medeed. Rijksm. Nat. Hist. Leiden 16: 46.

TYPE LOCALITY. Nightingale I, Tristan da Cunha, 100-150 fathoms (183-274 m).

Type specimen. Two syntypes are in the B.M.(N.H.), No.1887.2.9.1188-9, illustrated syntype length 27.0 mm, width 15.0 mm; there are 9-12 axials between varices, 2 main spiral rows of nodes on the penultimate and 7 rows on the body whorl, numerous spiral striae, and the shell is light brown in colour.

Family BUCCINIDAE

Genus **Pareuthria** Strebel, 1905

Pareuthria powelli nom. n. (Fig. 5)

1852. *Fusus plumbeus* Philippi, Gould, U.S. Expl. Exp. 12: 230, pl. 1, figs. 281, 281a (*non* Philippi, 1844).

1854. *Fusus roseus* Rousseau, Voy. Pole Sud 5: 107, pl. 25, figs. 4, 5 [*non Fusus roseus* Anton, 1838, Verz. Conchyl. p. 78].

1905. *Euthria rosea* Homb. & Jacq., Strebel, Zool. Jahrb. 22 (6): 616, pl. 21, figs. 1-4.

1951. *Pareuthria rosea* (Hombron & Jacquinot), Powell, Discovery Repts. 26: 133; 1951 Carcelles & Williamson, Rev. Inst. Nac. Cienc. Nat. Mus. Argentino 2 (5): 295; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 148; 1971 Dell, Rec. Dominion Mus. 7 (17): 206.

TYPE LOCALITY. Strait of Magellan.

Fusus roseus Rousseau, 1854, is a primary homonym of *F. roseus* Anton, 1838, The substitute name *Pareuthria powelli* is here proposed in recognition of Dr A. W. B. Powell's work on Antarctic and Subantarctic Mollusca.

Pareuthria scalaris (Watson, 1882) [*nom. praeocc.*]

1882. *Fusus (Sipho) scalaris* Watson, J. Linn. Soc. Lond., Zool. 16: 377 [*non Fusus scalaris* Lamarck, 1816, Tabl. Encyl. Méth. p. 6, pl. 425, fig. 7].

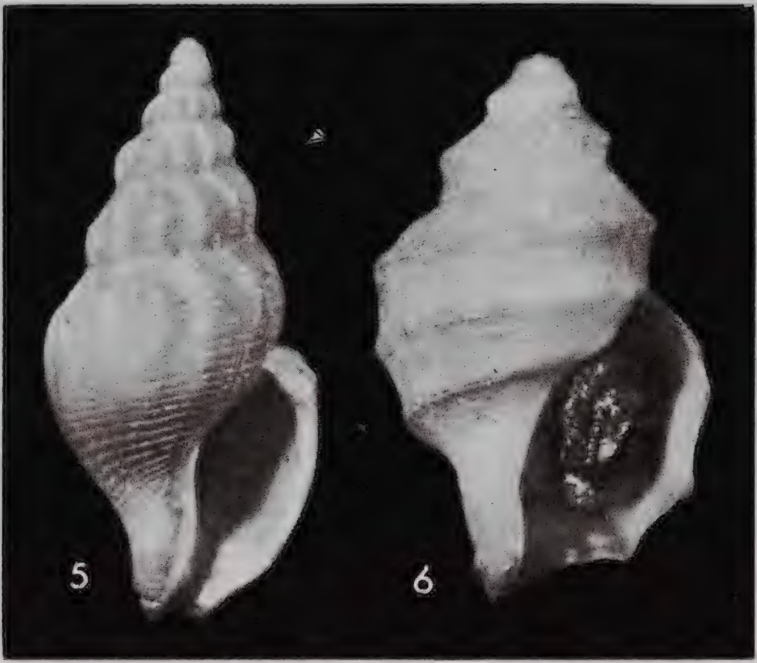
1886. *Fusus (Neptunea) scalaris* Watson, Rept. Sci. Res. Voy. H.M.S. Challenger 15: 203, pl. 12, fig. 5.

1951 *Neptunea scalaris* (Watson), Carcelles & Williamson, Rev. Inst. Nac. Cienc. Nat. Mus. Argentino 2 (5): 294.

1951. *Pareuthria scalaris* (Watson), Powell, Discovery Repts. 26: 134; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 148.

TYPE LOCALITY. N. W. Patagonia, 125 fathoms (229 m).

Fusus scalaris Watson, 1882, is a primary homonym of *F. scalaris* Lamark, 1816, which is a fossil from the Paris basin. No substitute name is proposed for *F. scalaris* Watson, since this species is considered to be conspecific with, and a synonym of *Pareuthria powelli*.



Figs. 5, 6. 5. *Pareuthria powelli* nom. n. Off Eddystone Rock, Falkland I, 115 m; length 13.2 mm. 6. *Tromina tricarinata* Powell. Off Cape Bowles, Clarence I, 342 m; paratype, length 15.4 mm.

Genus **Tromina** Dall, 1918

Tromina unicarinata (Philippi, 1868) [*nom. praeocc.*]

1868. *Fusus unicarinatus* Philippi, Malakozool. Blaetter 15: 223 [*non Fusus unicarinatus* Deshayes, 1835, Desc. Coq. foss. Parfis 2: 515.].
1902. ? *Trophon unicarinatus* Philippi, Dal, Proc. U.S. Nat. Mus. 24: 536.
1918. *Tromina unicarinata* (Philippi), Dall, Proc. Biol. Soc. Washington 31: 137; 1925 Dall, Proc. U.S. Nat. Mus. 66: 28, pl. 21, fig. 7; 1951 Powell, Discovery Repts. 26: 135.

TYPE LOCALITY. Strait of Magellan.

Fusus unicarinatus Philippi, 1886, is a primary homonym of *F. unicarinatus* Deshayes,1835, which is a fossil from the Paris Basin. *Tromina tricarinata* Powell, 1951, from Clarence I, Scotia Sea (Fig. 6) could prove to be a three-corded form of *T. unicarinata*, and if so, would be available as a substitute name.

Genus **Chlanidota** v. Martens, 1878

Chlanidota elongata (Lamy, 1910) [*nom. praeocc.*]

1910. *Cominella (Chlanidota) vestita* var. *elongata* Lamy, Bull. Mus. d'Hist. Nat. Paris 16: 319; 1911 Lamy Deux. Exp. Ant. France. p. 6, pl. 1, fig. 6; [*non Cominella elongata* Dunker, 1857, Proc. Zool. Soc. Lond. for 1856: 356].

1951. *Chlanidota elongata* (Lamy), Powell, Discovery Repts. 26: 140; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 150.

TYPE LOCALITY. Off King George I, Sth. Shetland Is, 420 m.

Cominella elongata Lamy, 1910, is a primary homonym of *C. elongata* Dunker, 1857. Powell (1951) considers Lamy's *elongata* to be specifically separable from the Kerguelen *Chlanidota vestita* (v.Martens,1878), and should this prove to be the case then a substitute name for Lamy's taxon would be required.

Genus **Bathydomus** Thiele, 1912

Bathydomus calathiscus (Watson, 1882) (Fig. 7)

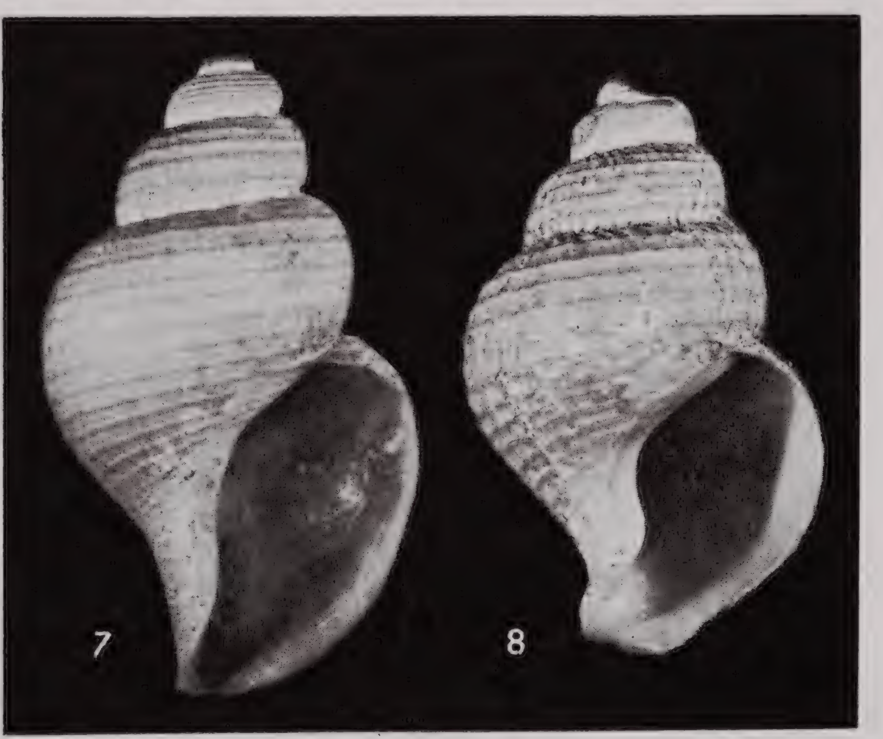
1882. *Fusus (Sipho) calathiscus* Watson, J. Linn. Soc. Lond., Zool. 16: 375.

1886. *Fusus (Neptunea) calathiscus* Watson, Repts. Sci. Res. Voy. H.M.S. Challenger 15: 201, pl. 12, fig. 13; 1958 Powell, B.A.N.Z. Ant. Res. Exp. Rep. (B) 6 (9): 195.

1913. *Bathydomus calathiscus* (Watson), Thiele, Deut. Suedpol. Exp. 13: 263; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 151; 1962 Clarke, Nat. Mus. Canada Bull. No. 181: 24.

TYPE LOCALITY. Off Marion I and the Crozets, 1600 fathoms (2926 m).

Type specimen. Holotype in the B.M.(N.H.), No.1887.2.9.697., length 30.6 mm, width 18.0 mm; the shell is thin and creamy-white, penultimate whorl with 6 spiral threads and body whorl with 21, additional numerous axial striae, columella smooth.



Figs. 7, 8. 7. *Bathydomus calathiscus* (Watson). Off Marion I and the Crozets, 2926 m; holotype BMNH No. 1887.2.9.697., 30.6 x 18.0 mm. 8. *B. setosus* (Watson). Off Marion I and the Crozets, 2926 m; holotype BMNH No. 1887.2.9.699., 25.0 x 15.7 mm.

Bathydomus setosus (Watson, 1882) (Fig. 8)

1882. *Fusus (Sipho) setosus* Watson, J. Linn. Soc. Lond., Zool. 16: 376.

1886. *Fusus (Neptunea) setosus* Watson, Rept. Sci. Res. Voy. H.M.S. Challenger 15: 202, pl. 12, fig. 4.

1913. *Bathydomus setosus* (Watson), Thiele, Deut. Suedpol. Exp. 13: 263; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 151; 1962 Clarke, Nat. Mus. Canada Bull. No. 181: 25.

TYPE LOCALITY. Off Marion I and the Crozets, 1600 fathoms (2926 m).

Type specimen. Holotype in the B.M.(N.H.) No.1887.2.9.699., length 25.0 mm, width 15.7 mm. The species also has 6 spiral threads like *B. calathiscus* but the axial threads are almost as strong as the spirals, and the shell is thin and white under a light fawn periostracum. The marked holotype came from Station 147, which is the type locality cited above.

Family MURICIDAE

Genus **Trophon** Montfort, 1810

Trophon acanthodes Watson, 1882 (Fig. 9)

1882. *Trophon acanthodes* Watson, J. Linn. Soc. Lond., Zool. 16: 386; 1886 Watson, Rept. Sci. Res. Voy. H.M.S. Challenger 15: 166, pl. 10, fig. 6.

1947. *Fusus acanthodes* (Watson), Carcelles, Com. Zool. Mus. Hist. Nat. Montevideo 2 (40): 12, pl. 2, figs. 1, 2; pl. 3, figs. 3-6; 1951 Carcelles & Williamson, Rev. Inst. Nac. Cienc. Mus. Argentino 2 (5): 300.

TYPE LOCALITY. W. Patagonia, 125 fathoms (229 m).

Type specimens. The holotype and 2 paratypes in the B.M.(N.H. No. 1887.2.9.568-570., specimen marked as holotype length 37.4 mm, width 23.6 mm.

Trophon albolabratus E. A. Smith, 1875 (Fig. 10)

1875. *Trophon albolabratus* E. A. Smith, Ann. Mag. Nat. Hist., (4) 16: 68; 1879 E. A. Smith, Phil. Trans. R. Soc. Lond. 168: 170, pl. 9, fig. 2; 1903 Thiele, Wiss. Erg. deut. Tief. Exp. Valdivia, 7: 166, pl. 8, fig. 49 (radula); 1957 Powell, B.A.N.Z. Ant. Res. Exp. Rep. (B) 6 (7): 134, pl. 2, fig. 9; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 152; 1964 Dell, Rec. Dominion Mus. 4 (20): 287.

1886. *Trophon cinguliferus* v. Martens & Pfeffer, Jahrb. Hamburg, Wiss. Anst. 3: 70, pl. 1, figs. 2a, b.

TYPE LOCALITY. Swains Bay and Royal Sound, Kerguelen Is *(T. albolabratus);* South Georgia *(T. cinguliferus).*

Type specimens. The holotype and paratype of *T. albolabratus* E. A. Smith, are in the B.M.(N.H.), No.1876.8.28.20., holotype length 39.2 mm, width 23.3 mm.

Trophon cepula Sowerby, 1880 (Fig. 11)

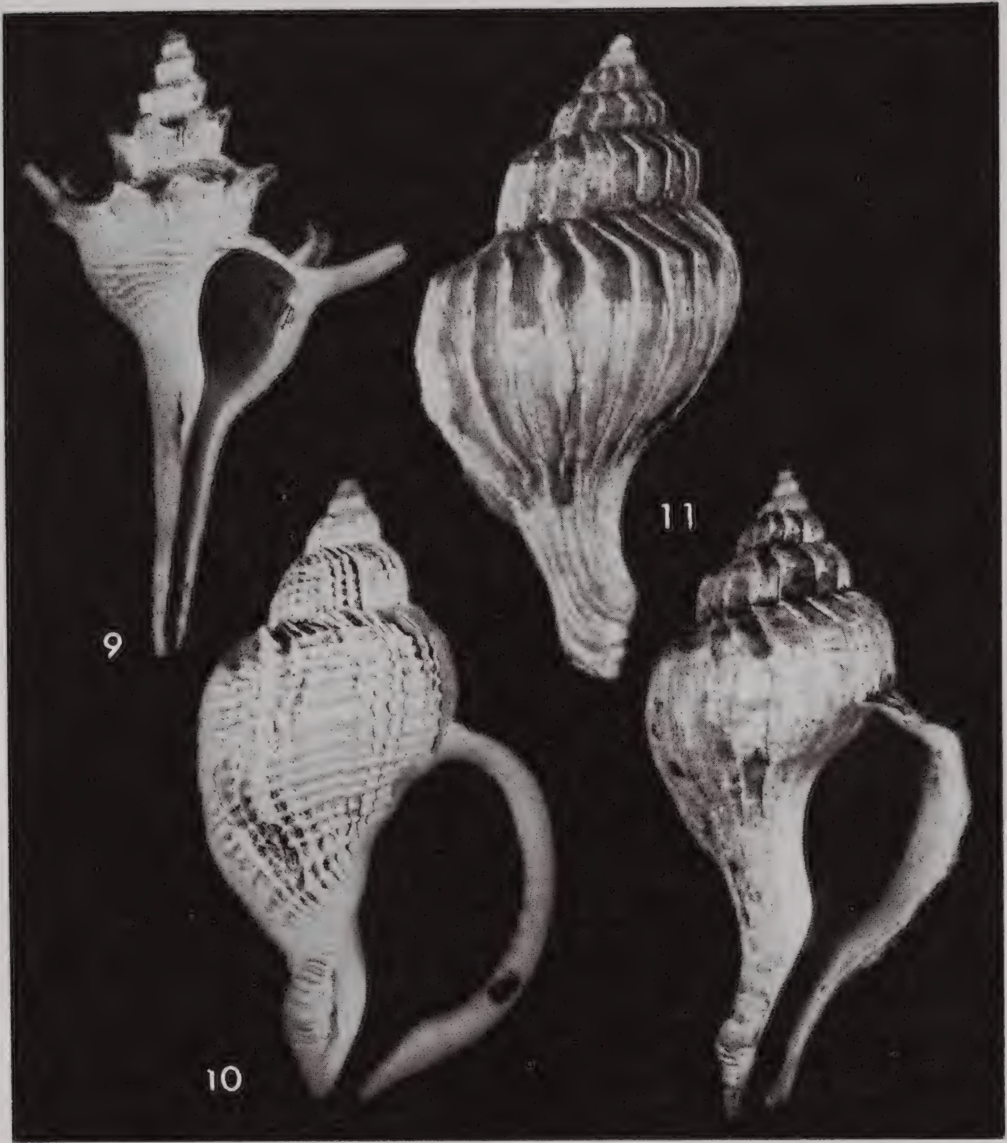
1839. *Fusus lamellosus* Gray, Zool. Capt. Beechey's Voy. p. 118, pl. 36, fig. 13 (*non* Borson, 1821; *nec* Philippi, 1836).

1880. *Trophon cepula* Sowerby, Thes. Conchyl. 4: 61, pl. 404, fig. 14; pl. 405, fig. 27.

TYPE LOCALITY. Icy Cape *(F. lamellosus);* None *(T. cepula).*

Type specimen. The holotype of *Trophon lamellosus* (Gray), which is also probably the type of *T. cepula* Sowerby, is in the B.M.(N.H.), length 34.8 mm, width 17.4 mm. There are 18 axial ribs on the penultimate and 19 ribs on the body whorl.

Trophon cepula has never been properly localized but the species does not belong to the Southern Seas fauna. It closely resembles certain forms of *Boreotrophon clathratus* (Linnaeus, 1767) from Arctic Seas.



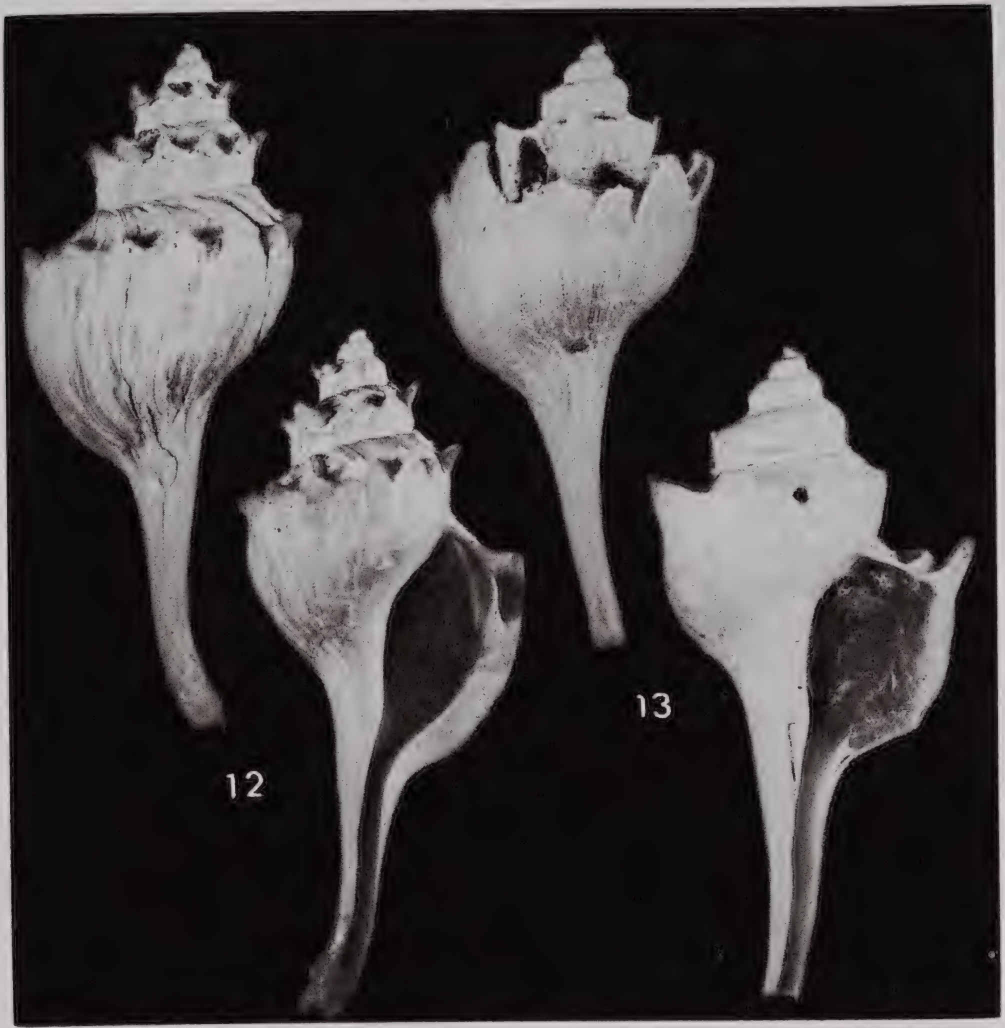
Figs. 9-11. 9. *Trophon acanthodes* Watson. W. Patagonia, 229 m; holotype BMNH No. 1887,2.9.568., 37.4 x 23.6 mm. 10. *T. albolabratus* E. A. Smith. Swains Bay and Royal Sound, Kerguelen Is; holotype BMNH No. 1876.8.28.20., 39.2 x 23.3 mm. 11. *T. cepula* Sowerby. Type of *Fusus lamellosus* Gray, and probably *Trophon cepula* Sowerby. BMNH, 34.8 x 17.4 mm.

Trophon coronatus H. & A. Adams, 1864 (Fig. 12)

1864. *Trophon coronatum* H. & A. Adams, Proc. Zool. Soc. Lond. for 1863: 429.
1880. *Trophon coronatus* Adams, Tyron, Man. Conch. 2: 148.
1880. *Trophon goodericihii* Forbes. Sowerby, Thes. Conchyl. 4: 62, pl. 405, figs. 25, 26.

TYPE LOCALITY. New Zealand = error.

Type specimen. The holotype is in the B.M.(N.H.), length 43.0 mm, width 17.5 mm.



Figs. 12, 13. 12. *Trophon coronatus* H. & A. Adams. Holotype BMNH, 43.0 x 17.5 mm. 13. *T. septus* Watson. Royal Sound, Kerguelen Is, 51 m; syntypes BMNH No. 1887.2.9. 578-9, 21.1 x 10.5 mm (ventral view), 20.0 mm (dorsal view).

The original locality of New Zealand is erroneous since *T. coronatus* does not occur there. Specimens closely resembling *T. coronatus* and *T. septus* Watson, 1882, have been seen from the Kerguelen Is, and it is possible that *T. coronatus* is a chronologically prior name for *T. septus*. Sowerby (1880) placed *T. coronatus* in the synonymy of *T. goodridgii* Forbes, 1852.

Trophon septus Watson, 1882 (Fig. 13)

1882. *Trophon septus* Watson, J. Linn. Soc. Lond., Zool. 16: 391; 1886 Watson, Rept. Sci. Res. Voy. H.M.S. Challenger 15: 170, pl. 10. fig. 11; 1903 v. Martens, Wiss. Erg. deut Tief. Exp. Valdivia, 7: 62; 1957 Powell, B.A.N.Z. Ant. Res. Exp. Rep. (B) 6 (7): 134; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 154.

TYPE LOCALITY. Royal Sound, Kerguelen Is, 28 fathoms (51 m).

Type specimens. Two syntypes are in the B.M.(N.H.), No. 1887.2.9.578-9.; syntype illustrated in ventral view length 21.1 mm, width 10.5 mm, syntype in dorsal view length 20.0 mm.

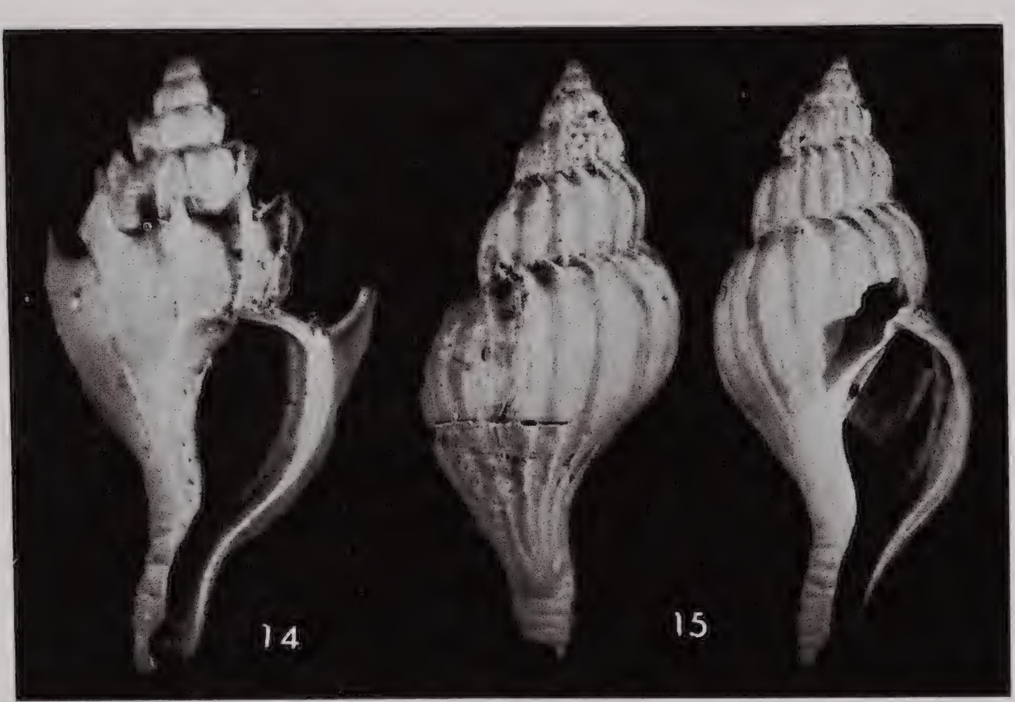
Larger and more mature specimens of *T. septus* from the Kerguelen Is closely resemble *T. coronatus* H. & A. Adams, 1864.

Trophon coulmanensis E. A. Smith, 1907 (Fig 14)

1907. *Trophon coulmanensis* E. A. Smith, Nat. Ant. Exp. Discovery, Nat. Hist. 2: 3, pl. 1, figs. 4a, b; 1915 E. A. Smith, Brit. Ant. Terra Nova Exp., Zool. Moll. 2 (4): 73. pl. 1, fig. 14; 1916 Hedley, Aust. Ant. Exp., (C) 4 (1): 61, pl. 9, fig. 99; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 153.

TYPE LOCALITY. Off Coulman I, Antarctica, 100 fathoms (183 m).

Type specimen. The holotype is in the B.M.(N.H.), No.1905.9.25.02., length 13.2 mm, width 7.0 mm.



Figs. 14, 15. 14. *Trophon coulmanensis* E. A. Smith. Off Coulman I, 183 m; holotype BMNH No. 1905.9.25.02.. 13.2 x 7.0 mm. 15. *T. declinans* Watson. Off Marion I, Prince Edward Is, 126 m; syntype BMNH No. 1887. 2.9.573., 19.5 x 8.0 mm.

Trophon declinans Watson, 1882 (Fig. 15)

1882. *Trophon declinans* Watson, J. Linn. Soc. Lond., Zool. 16: 388; 1886 Watson, Rept. Sci. Res. Voy. H.M.S. Challenger 15: 168, pl. 10, figs. 10a-c; 1951 Powell, Discovery Repts. 26: 155; 1951 Carcelles & Williamson, Rev. Inst. Nac. Cienc. Nat. Mus. Argentino 2 (5): 289; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3, 4): 153.

TYPE LOCALITY. Off Marion I, Prince Edward Is, 69 fathoms (126 m) [selected Powell 1951].

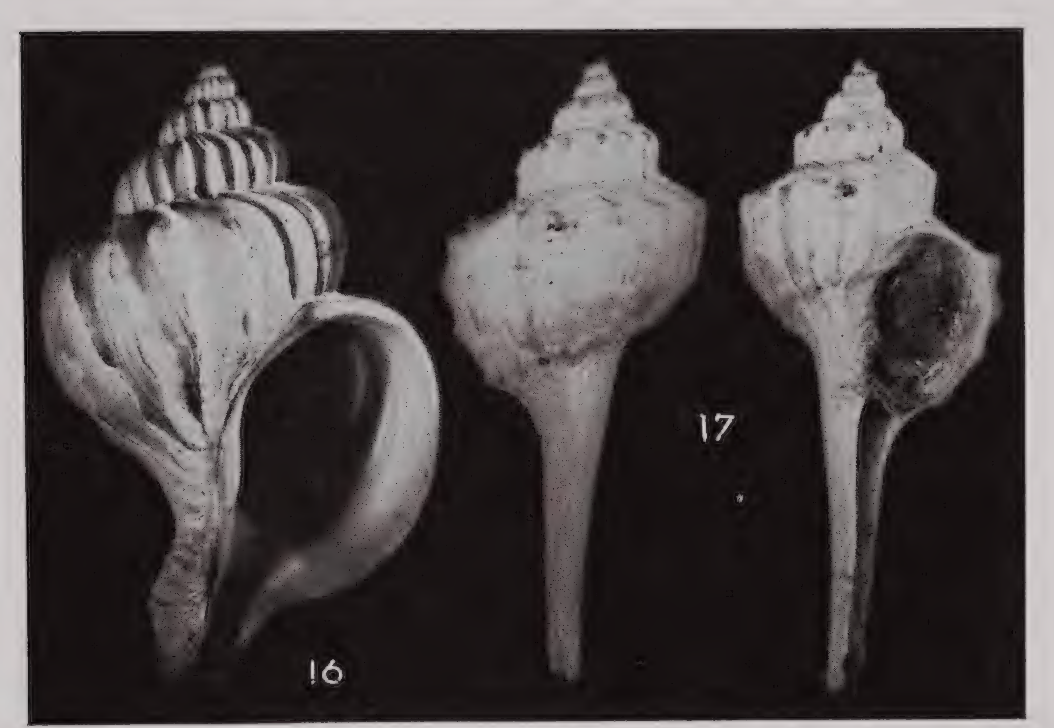
Type specimens. Two syntypes are in the B.M.(N.H.), No.1887.2.9.573-4.; syntype from Marion I (now holed on the ventral side of body whorl) length 19.5 mm, width 8.0 mm (Fig. 15). *Trophon ohlini* Strebel, 1905, from the Magellanic Province is very similar to *T. declinans* Watson.

Trophon longstaffi E. A. Smith, 1907 (Fig. 16)

1907. *Trophon longstaffi* E. A. Smith, Rept. Nat. Ant. Exp. Discovery, Nat. Hist. 2: 3, pl. 1, figs. 3a-d; 1911 Hedley, Brit Ant. Exp., Biology 2 (1): 8, pl. 1, fig. 14; 1915 E. A. Smith, Brit. Ant. Terra Nova Exp., Nat. Hist. 2 (4): 73; 1923 Eales, Brit. Ant. Terra Nova Exp., Zool. Moll. 7 (1): 31, figs. 31-33 (anatomy & radula); 1960 Powell, Rec. Auckland Inst. Mus. 5 (3. 4) 154; 1972 Arnaud, Tethys Suppl. 4: 131.

TYPE LOCALITY. Flagon Point, 1 mi. Nth. of ship, [Ross Sea], 20 fathoms (37 m).

Type specimens. Seven syntypes of the original nine are in the B.M.(N.H.), No.1905.-9.25.43-51.; specimen originally illustrated length 40.6 mm, width 25.7 mm. The original locality label reads "Winter Quarters, Hut Point, Antarctic".



Figs. 16, 17. 16. *Trophon longstaffi* E. A. Smith. Flagon Point, Ross Sea, 37 m; syntype BMNH No. 1905.9.25.43., 40.6 x 25.7 mm. 17. *T. scolopax* Watson. Between Kerguelen and Heard Is, 274 m; holotype BMNH No. 1887.2.9.580., 23.4 x 10.4 mm.

Trophon scolopax Watson, 1882 (Fig. 17)

1882. *Trophon scolopax* Watson, J. Linn. Soc. Lond., Zool. 16: 392; 1886 Watson, Rept. Sci. Res. Voy. H.M.S Challenger 15: 171, pl 10, fig. 12; 1960 Powell, Rec. Auckland Inst. Mus. 5 (3. 4): 154.

TYPE LOCALITY. Between Kerguelen and Heard Is, 150 fathoms (274 m).

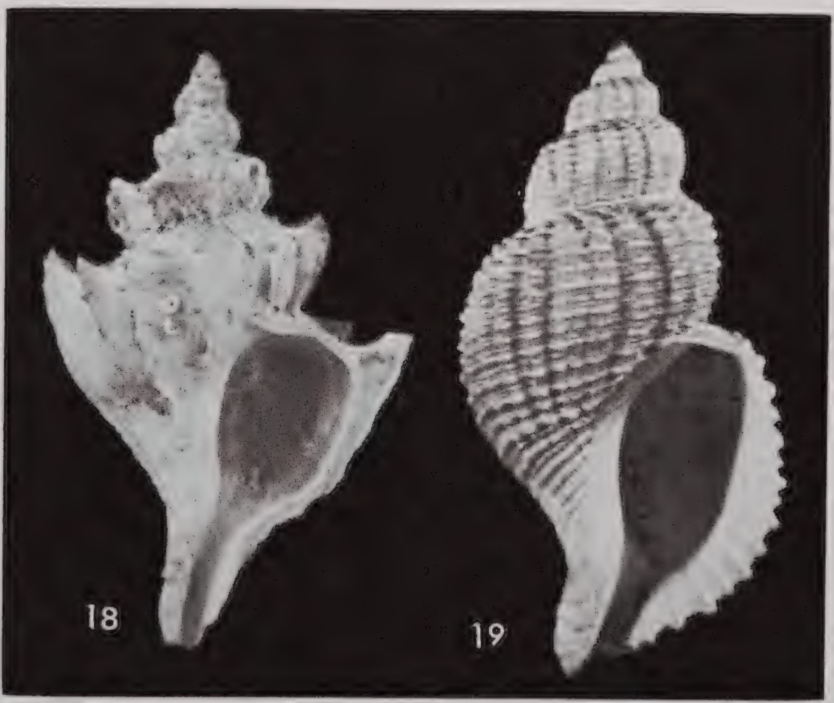
Type specimen. Holotype in the B.M.(N.H.), No. 1887.2.9.580., length 23.4 mm, width 10.4 mm.

Trophon plicatus (Solander in Lightfoot, 1786) (Fig. 18)

1784. *Buccinum laciniatum* Martyn, Univ. Conch. 2: pl. 42 *(non binom.).*
1786. *Murex plicatus* Solander in Lightfoot. Cat. Portland Mus. p. 104 (ref. to Favanne, pl. 79, fig. I); 1921 Dall, Nautilus, 34: 99.
1791. *Murex lamellosus* Gmelin, Syst. Nat. ed. 13: 3536 (ref. Martyn, vol. 2, pl. 42).
1811. *Polyplex gracilis* Perry, Conchology, pl. 9, fig. 4.
1854. *Fusus laciniatus* Hupé in Gay, Hist. fis. & polit. Chile 8: 168 (ref. to Martyn, vol. 2, fig. 42).
1946. *Trophon laciniatus* (Martyn), Carcelles, Not. Mus. de la Plata 11 (93): 69, figs. 6a, b; 7a-d; 8.
1951. *Trophon (Stramonitrophon) laciniatus* (Martyn), Powell, Discovery Repts. 26: 156.
1960. *Trophon (Stramonitrophon) laciniatus* (Hupé), Powell, Rec. Auckland Inst. Mus. 5 (3. 4): 155.
1967. *Trophon plicatus* (Lightfoot), Rehder, Proc. U.S. Nat. Mus. 121: 20.
1971. *Trophon (Stramonitrophon) lamellosa* (Gmelin), Dell, Rec. Dominion Mus. 7 (17): 212.

TYPE LOCALITY. Falkland Is *(M. plicatus* and *M. lamellosus);* New Zealand = error *(P. gracilis);* Strait of Magellan *(F. laciniatus* Hupé in Gay).

Recent authors have used the invalid non-binomial taxon "*Buccinum laciniatum* Martyn, 1784" for this species. Dell (1971) replaced the non-binomial usage with *Trophon lamellosus* (Gmelin, 1791), but overlooked the prior taxon *T. plicatus* (Solander in Lightfoot, 1786), which is the correct name applicable for the Magellanic species.



Figs. 18, 19. 18. *Trophon plicatus* (Solander in Lightfoot). E. of Lively I, E. Falkland Is, 79 m; length 36.6 mm. 19. *Xymenopsis corrugatus* (Reeve). Holotype BMNH No. 1874. 12.11.153., 30.8 x 15.4 mm.

Genus **Xymenopsis** Powell, 1951

Xymenopsis corrugatus (Reeve, 1848) (Fig. 19)

1848. *Fusus corrugatus* Reeve, Conch. Icon. 4: pl. 20, figs. 84a, b.

TYPE LOCALITY. None.

Type specimen. Holotype in the B.M.(N.H.), No.1874.12.11.153., length 30.8 mm, width 15.4 mm. The shell is brownish in colour, the penultimate whorl has 21 axial ribs and body whorl 19.

Dell (1972) illustrated the type-specimen of *Xymenopsis muriciformis* (King & Broderip, 1832), which shows a shell with coarse, rounded axial ribs and incised spiral grooves. To the typical form belong the subsequently named taxa *decolor* Philippi, 1845, *lebruni* and *violacea* of Mabille & Rochebrune, 1891, and *couthouyi* and *paessleri* of Strebel, 1904.

Xymenopsis corrugatus appears to be a form with more slender axial ribs and prominent, overriding granulose spiral cords. This form has received the names *albidus* Philippi, 1846, *liratus* Gould, 1849, and *brucei, elegans, hoylei, ornatus* and *standeni,* all of Strebel, 1904. *Trophon ringei* Strebel, 1904, has been based on individuals with a very fine sculpture and more numerous ribs, and Strebel (1904) named several new forms which connect the typical form *X. muriciformis* with its various sculptural variants.

Genus **Acanthina** Fischer de Waldheim, 1807

Acanthina monodon (Pallas, 1774)

1774. *Buccinum monodon* Pallas, Spicilegia Zoologica 10 (3): 33, pl. figs. 3, 4.

1784. *Buccinum calcar* Martyn, Univ. Conchol. 1: fig. 10 *(non binom.).*

1786. *Buccinum monodon* Solander in Lightfoot, Cat. Portland Mus. p. 17 (ref. to Martyn, *op. cit.,* fig. 10e).

1789. *Buccinum monoceros* Bruguière, Encycl. méth. Hist. Nat. vers 1: 253.

1816. *Monoceros imbricatum* Lamarck, Tabl. Encycl. Méth. p. 2, pl. 396, figs. 1a, b.

1954. *Nucella (Acanthina) calcar* (Martyn), Carcelles, Com. Inst. Nac. Cienc. Nat. Mus. Ergent. 2 (16). 259, pl. 1, figs. 5:11; pl. 2, figs. 12-22.

1971. *Acanthina monodon* (Solander), Dell, Rec. Dominion Mus. 7 (17): 208.

TYPE LOCALITY. Magellanic Seas *(B. monodon* and *M. imbricatum);* Cape Horn and Straits of Magellan *(B. monoceros).*

Recent authors use either the non-binomial "*calcar* Martyn" for this species or credit the authorship of *Buccinum monodon* to Solander. *Acanthina monodon* (Pallas, 1774), is the earliest name for this South American species.

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1879 Mollusca of H.M.S. "Challenger" Expedition. IV. Trochidae continued, viz. the genera *Basilissa* and *Trochus,* and the Turbinidae, viz. the genus *Turbo. J. Linn. Soc. London, Zool.* 14: 692-716.

THE TAXONOMY OF SOME INDO-PACIFIC MOLLUSCA

Part 5. With descriptions of new taxa and remarks on *Nassarius albus* (Say)

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Abstract. A species of Mitridae from the Hawaiian Islands and a species of Triphoridae from the Samoa Islands are described as new to science. The Hawaiian *Mitra foveolata* Dunker, is a subspecies of *Subcancilla verrucosa* (Reeve). The nassarid species *Nassa clathratula* A. Adams and *N. obtusata* A. Adams, erroneously described from the Philippines, and *N. annelifera* Reeve, from unknown locality, are synonyms of the Caribbean *Nassarius albus* (Say). The nassarid genus-group *Gussonea* Monterosato, 1912, has chronological priority over *Amyclina* Iredale, 1918. *Phos naucratoros* Watson, is recorded from Queensland, Australia, and the Australian Pliocene *Austroharpa tatei* Finlay, is here compared with *A. sulcosa* Tate.

Family MITRIDAE

Genus **Mitra** Lamarck, 1798

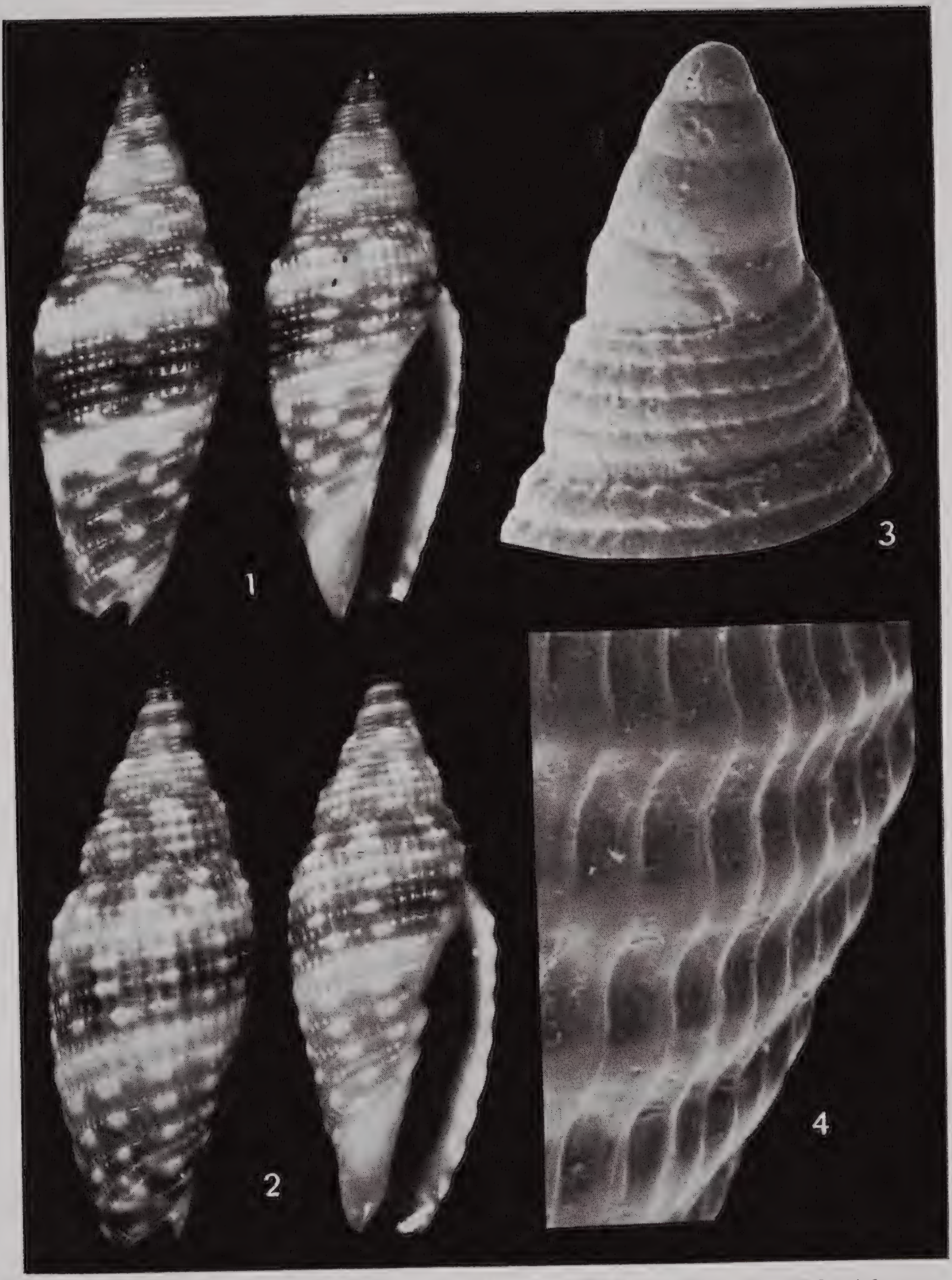
Mitra Lamarck, 1798. Tabl. Encycl. Méth. pl. 369. Type species by T *Voluta mitra* Linnaeus, 1758 (Opinion 885 of ICZN). Recent, Indo-Pacific.

Subgenus **Nebularia** Swainson, 1840

Mitra (Nebularia) earlei sp. n. (Figs. 1-5)

Shell moderately small, 11.5 - 16.0 mm in length, fusiformly-elongate, width 34%-37% of length, moderately solid, teleoconch of 5¾-6¾ convex whorls, protoconch of 3¼-3¾ smooth, glassy, multispiral, conical embryonic whorls; sculptured with strong, moderately elevated spiral cords which number from 4-6 (usually 5) on the penultimate and from 12-17 on the body whorl; spiral cords are bisected by moderate or strong longitudinal lirae which often produce a pitted or clathrate appearance on usually the last two whorls. Aperture slightly longer than the spire, 55%-62% of length, narrow, interior smooth, outer lip convex and foliated on the edge from the intruding spiral cords, columella with 4-5 oblique folds which decrease in size anteriorly; siphonal canal straight, siphonal notch distinct. Base colour white but with a pale lilac or rose cast in fresh specimens, protoconch brown to purple-brown, first 2-3 post-embryonic whorls frequently pale violet, body whorl with 3 orange-brown transverse bands with the narrowest band situated at the body whorl suture, and moderately large and laterally slightly elongated snow-white spots are present on the spiral cords; aperture white or pinkish-white and usually with 2 nebulous brown stains.

Radula typically mitrine, rachidian tooth rectangular and with 11 moderately



Figs. 1-4. *Mitra (Nebularia) earlei* sp. n. 1. Holotype AIM No. TM-1351; 12.8 x 4.6 mm. 2. Paratype, 13.8 x 5.0 mm. 3. Protoconch; SEM photograph, x 35. 4. Detail of sculpture; SEM photograph, x 40.

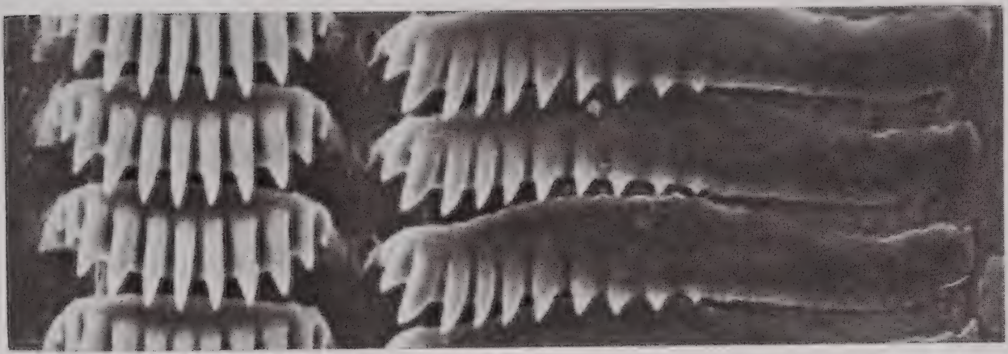


Fig. 5. *Mitra (Nebularia) earlei* sp. n. One-half of radula; SEM photograph, x 375.

long and slender denticles, laterals twice as broad as rachidians and with 12 denticles which decrease in size posteriorly, last one-third of base of lateral edentulous (Fig. 5).

TYPE LOCALITY. Pokai Bay, Oahu, Hawaiian Is. 110 - 183 m, in sand and coralline algae.

Holotype. Auckland Institute and Museum No. TM-1351; length 12.8 mm, width 4.6 mm, height of aperture 7.2 mm (Fig. 1).

Paratypes. The remaining 60 paratypes are in the National Museum of Natural History, Smithsonian Institution, Washington; the Delaware Museum of Natural History, Greenville; the Bernice P. Bishop Museum, Honolulu; the Philadelphia Academy of Natural Sciences, Philadelphia; coll. A. C. Adams; J. Earle; H. Eker; L. Hill; G. Lindner; R. Salisbury and C. Wolfe.

The sculpture of overriding longitudinal lirae (Fig. 4) is a feature usually found in the genus *Domiporta* Cernohorsky, 1970, or *Scabricola* Swainson, 1840, but the radula of *M. earlei* is typically mitrine and considerably different from the radula of either *Domiporta* or *Scabricola. M. (N.) earlei* is superficially similar to *M. (N.) suturata* Reeve, 1845, but this species is considerably larger, more cylindrical and constricted towards the base, the grooves between the close-set cords are pitted or axially lirate and the strong longitudinal sculpture of *M. earlei* is absent in *M. suturata.*

The species is provisionally placed in the subgenus *Nebularia* until a comparison of the radular anatomy with *Cancilla isabella* (Swainson, 1831) can be made. The species is named for Mr. J. L. Earle, Ewa Beach, Hawaii, who was instrumental in dredging specimens of the new species in 183 m at Pokai Bay.

Genus **Subcancilla** Olsson & Harbison, 1953

Subcancilla Olsson & Harbison, 1953, Acad. Nat. Sci. Philad. Mon. No. 8: 190. Type species by OD *Mitra sulcata* Swainson in Sowerby, 1825. Recent, Eastern Pacific.

Subcancilla verrucosa foveolata (Dunker, 1862) (Figs. 8-10)

1862. *Mitra foveolata* Dunker, Novit. Conch. p. 46, pl. 15, figs. 5, 6, 6a.

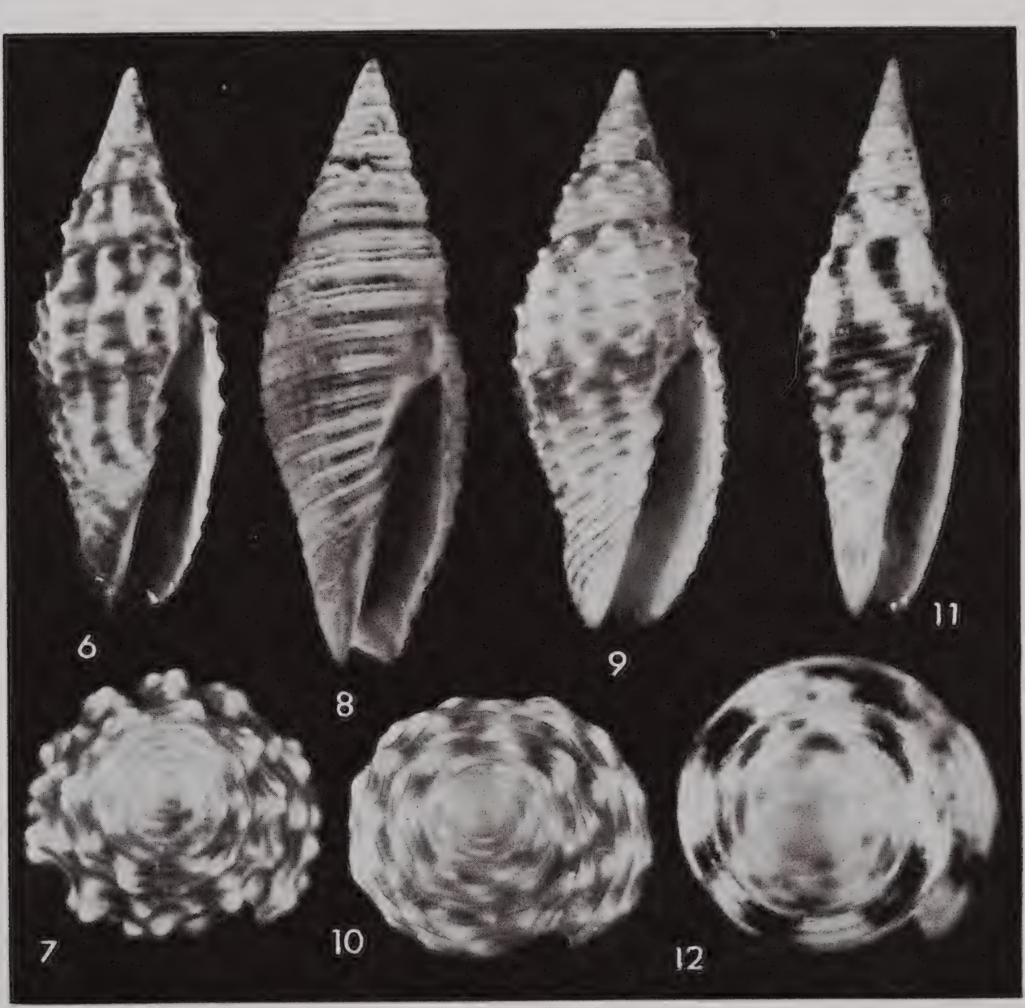
1874. *Mitra foveolata* "Hanley" (*pars*), Sowerby, Thes. Conchyl. 4: 46, pl. 359, fig. 370 only.

1952. *Mitra foveolata* Dunker, Tinker, Pacific Sea Shells, p. 56, plate facing page, figs. in bottom row.

TYPE LOCALITY. None.

Von Martens (1880) synonymized *Mitra foveolata* with *Subcancilla interlirata* (Reeve) and Tryon (1882) and von Martens (1903) placed the species in the synonymy of *Subcancilla flammea* (Quoy & Gaimard). Sowerby (1874) erroneously credited Hanley with the authorship of *"Mitra foveolata"* and illustrated 2 specimens from the "Sandwich Is" which represent two different species. The larger, 36.7 mm specimen illustrated in fig. 371 is a worn and faded *Neocancilla clathrus* (Gmelin), and the smaller, 25.1 mm long specimen depicted in fig. 370 is the Hawaiian *foveolata* Dunker.

Both *S. verrucosa* (Reeve, 1845) and *S. foveolata* have axial folds which bisect the spiral cords and produce nodes at the point of intersection. The axial folds are prominent and the nodules more echinate in *S. verrucosa,* but are more subdued and less echinate in *S. foveolata;* the degree of prominence of axial sculpture can be clearly seen when the



Figs. 6-12. Ventral and spire views. 6, 7. *Subcancilla verrucosa verrucosa* (Reeve); Rabaul, New Britain, 25.6 x 9.1 mm. 8-10. *S. verrucosa foveolata* (Dunker). 8. Holotype Zool. Mus. Berlin; 26.4 x 9.2 mm. 9, 10. Specimen from Electric Beach, Oahu, Hawaiian Is, 9 m; 22.5 x 8.7 mm. 11, 12. *S. interlirata* (Reeve); Nordup, New Britain, 30.0 x 9.0 mm.

shell is viewed from the spire (Figs. 6, 7, 9, 10). *S. interlirata* lacks the axial folds, nodules and undulate sutures (Figs. 11, 12).

According to available Museum records, *S. verrucosa verrucosa* lives in the Western Pacific area extending from the Philippines to the Marshall Is, Fiji Is, New Caledonia and back to the Philippines. *S. verrucosa foveolata* appears to be endemic to the Hawaiian Is.

Family NASSARIIDAE

Genus **Nassarius** Duméril, 1806

Nassarius Duméril, 1806, Zool. analyt. p. 166. Type species by SM (Froriep, 1806) *Buccinum arcularia* Linnaeus, 1758. Recent, Indo-Pacific.

Nassarius albus (Say, 1826) (Figs. 13-16)

1799. *Buccinum ambiguum* Pulteney, Cat. Birds Dorset, p. 42; 1803 Montague, Test. Brit. pl. 9, fig. 7 (*non* Solander 1766).

1826. *Nassa alba* Say, J. Acad. Nat. Sci. Philad. 5: 212 (Sth. coast of E. Florida and West Indies).

1843. *Nassa candei* d'Orbigny in Sagra, Hist. phys. polit. nat. l'ile Cuba, 2: 142, pl. 23, figs. 4-6.

1845. *Buccinum candidissimum* C. B. Adams, Proc. Bost. Soc. Nat. Hist. 2: 2 (Jamaica).

1852. *Nassa clathratula* A. Adams, Proc. Zool. Soc. Lond. Pt. 19: 99 (Siquijor I, Philippines = error); 1853 Reeve, Conch. Icon. 8: pl. 19, figs. 125a, b.

1852. *Nassa obtusata* A. Adams, Proc. Zool. Soc. Lond. Pt. 19: 100 (Ticao I, Philippines = error): 1853 Reeve, Conch. Icon. 8: pl 20, fig. 135.

1853. *Nassa annelifera* Reeve, Conch. Icon. 8: pl. 25, fig. 168 (Hab:?).

1877. *Nassa paucicostata* Marrat, Prop. forms gen. *Nassa,* p. 11 (Nassau); 1940 Tomlin, Proc. Malac. Soc. Lond. 24: 37.

1877. *Nassa pura* Marrat, Prop. forms gen. Nassa, p. 13 (West Indies); 1940 Tomlin, Proc. Malac. Soc. Lond. 24: 37.

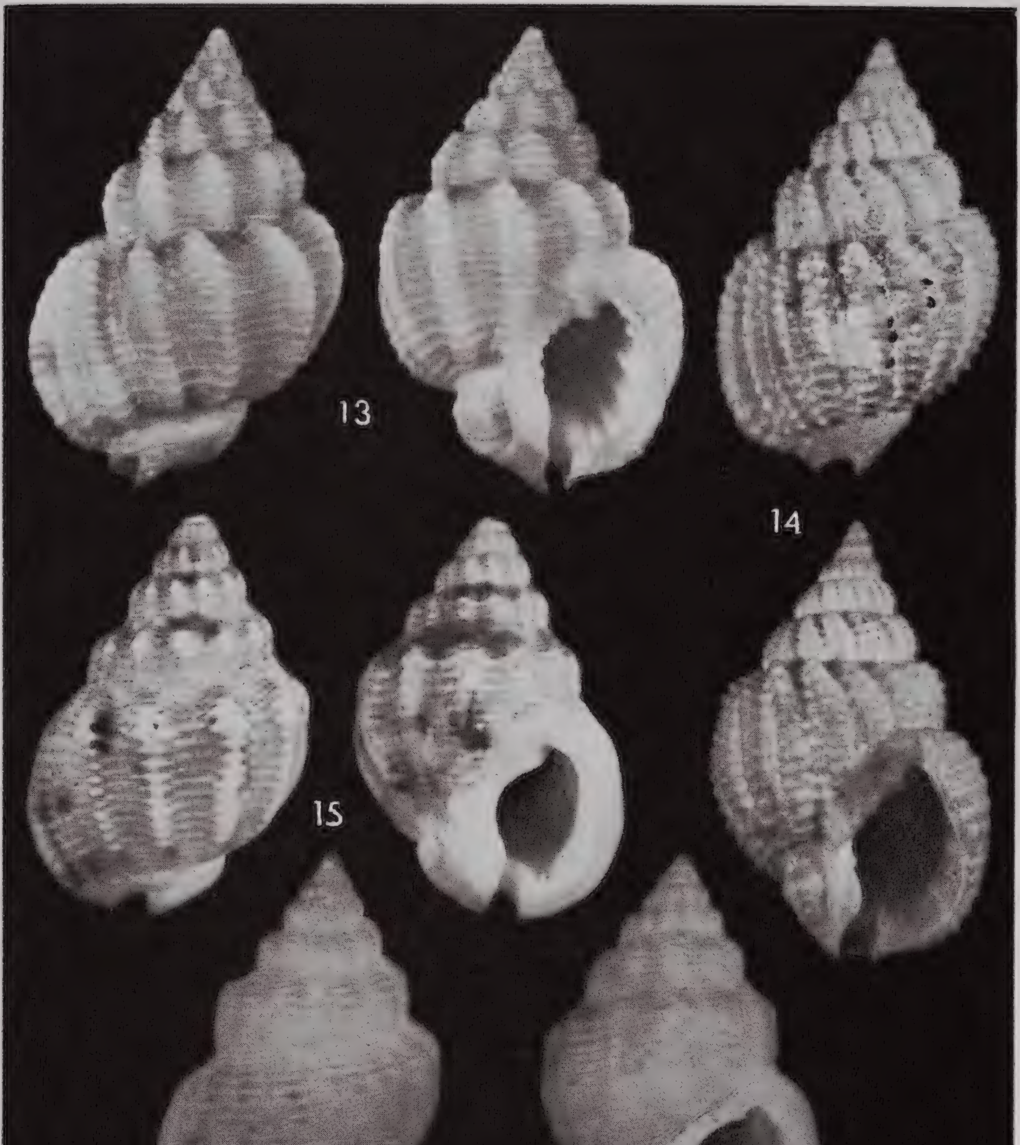
1880. *Nassa quinquecostata* Marrat, Var. shells gen. Nassa, pp. 61, 82 (Hab:?) [spelled *N. quinqueplicata* on p. 89]; 1940 Tomlin, Proc. Malac. Soc. Lond. 24: 38.

1959. *Nassarius nanus* Nowell-Usticke, Check-list mar. shells St. Croix, p. 70, pl. 4, fig. 5 (St. Croix) [*non Nassa nana* A. Adams, 1852 = *Nassarius*].

Nassarius albus (Say) is an exceedingly variable species which has received 11 or more names. The following species should be added to the species synonymy.

Nassa clathratula A. Adams: the holotype is in the B.M.N.H. No. 197323, length 14.8 mm, width 9.5 mm; the axial ribs are slightly more slender than in typical individuals of *Nassarius albus,* and the spiral threads are crisp and override the axials. The locality indication of "Siquijor I, Philippines" is an error (Fig. 14).

Nassa obtusata A. Adams: three syntypes are in the B.M.N.H. No. 19713, dimensions of illustrated syntype length 12.0 m, width 8.3 mm. The syntype is very worn and has coarse axial ribs. The locality indication of "Ticao I, Philippines" is an error (Fig. 15).



Figs. 13-16. *Nassarius albus* (Say). 13. Specimen from Grassy Key, Florida Keys, U.S.A.; 14.9 x 9.7 mm. 14. Holotype of *Nassa clathrata* A. Adams, BMNH No. 197323; 14.8 x 9.5 mm. 15. Syntype of *Nassa obtusata* A. Adams, BMNH No. 19713; 12.0 x 8.3 mm. 16. Syntype of *Nassa annelifera* Reeve, BMNH No. 19712; 13.0 x 8.1 mm.

Nassa annelifera Reeve: Two syntypes are in the B.M.N.H. No. 19712, dimensions of illustrated syntype length 13.0 mm, width 8.1 mm. The syntype also has coarse axial ribs which become somewhat obsolete on the dorsal side of the body whorl (Fig. 16).

Subgenus **Gussonea** Monterosato, 1912

Gussonea Monterosato, 1912, J. Conchyl. 59 (4): 295. Type species by M *Buccinum tinei* Maravigna, 1840. Recent, Mediterranean.

1853. *Amycla* H. & A. Adams, Gen. Rec. Moll. 1: 186. Type species by SD (Bucquoy, Dautzenberg & Dollfus, 1882) *Buccinum corniculum* Olivi, 1792. Recent, Mediterranean-West Africa (*non Amycla* Rafinesque, 1815; *nec* Doubleday, 1849).

1918. *Amyclina* Iredale, Proc. Malac. Soc. Lond. 13: 28, 31. Type species (Art. 67 (i) of ICZN) *Buccinum corniculum* Olivi, 1792 (*nom. subst. pro A*mycla H. & A. Adams, 1853).

1972. *Fackia* Nordsieck, Mioz. Moll. Miste-Winterswijk, p. 78. Type species by OD *Nassa facki* Koenen, 1872. Miocene of Europe.

When Iredale (1918) proposed *Amyclina* for the homonymous *Amycla* H. & A. Adams, 1853, he overlooked the prior generic group *Gussonea* which Monterosato (1912) proposed for *Buccinum tinei* Maravigna, from the Mediterranean. Nordsieck (1968) and Parenzan (1970) place *B. tinei* in *Amyclina,* a genus-group which has been either treated as a full genus or a subgenus of either *Nassarius* or *Hinia. Buccinum tinei* is indeed consubgeneric with *Nassarius corniculus* (Olivi), and *Amyclina* Iredale, 1918, will have to be replaced by *Gussonea* Monterosato, 1912. It should be pointed out, however, that species of *Gussonea* are conchologically similar to species of *Telasco* H. & A. Adams, 1853 (type-species *Buccinum cuvierii* Payraudeau, 1826).

Family BUCCINIDAE

Genus **Phos** Montfort, 1810

Phos Montfort, 1810, Conchyl. Syst. 2: 495. Type species by OD *Murex senticosus* Linnaeus, 1758. Recent, Indo-Pacific.

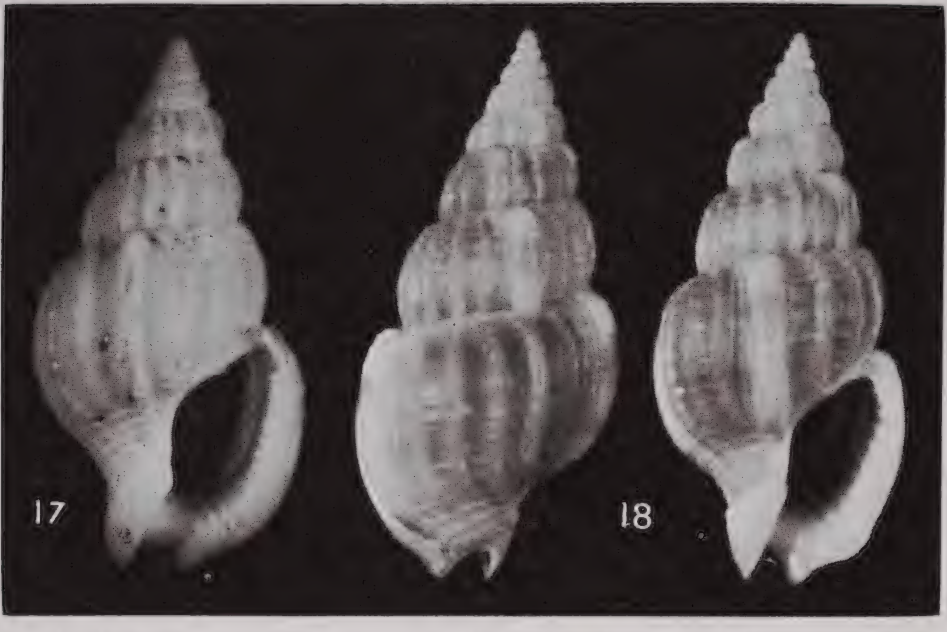
Phos naucratoros Watson, 1882 (Figs. 17, 18)

1882. *Phos naucratoros* Watson, J. Linn. Soc. Lond. 16: 360.

1886. *Phos naucratoris (sic),* Watson, Rept. Sci. Res. Voy. H.M.S. Challenger, 15: 218, pl. 13, figs. 11a-c.

TYPE LOCALITY. Admiralty Is, Papua New Guinea, 150 fathoms (275 m).

The species is creamy-white in colour, occasionally with faint reddish-brown bands It is variable in shape, some specimens being broader than others, some of the axial ribs are thickened into varices and spiral sculpture consists of primary spiral cords and fine intermediate spiral striae. Numerous specimens of this species have been recently dredged off Cape Moreton, Queensland, Australia, in 110-137 m.



Figs. 17, 18. *Phos naucratoros* Watson. 17. Holotype BMNH No. 1887. 2. 9. 749.; 24.2 x 12.3 mm. 18. Specimen from Cape Moreton, Qld., Australia, 119 m; 24.8 x 12.0 mm.

Family HARPIDAE

Genus **Austroharpa** Finlay, 1931

Austroharpa Finlay, 1931, Trans. Proc. N.Z. Inst. 62: 13. Type species by OD *Harpa pulligera* Tate, 1889. Miocene of Victoria, Australia.

Austroharpa tatei Finlay, 1931 (Fig. 20)

1931. *Austroharpa tatei* Finlay, Trans. Proc. N.Z. Inst. 62: 14.

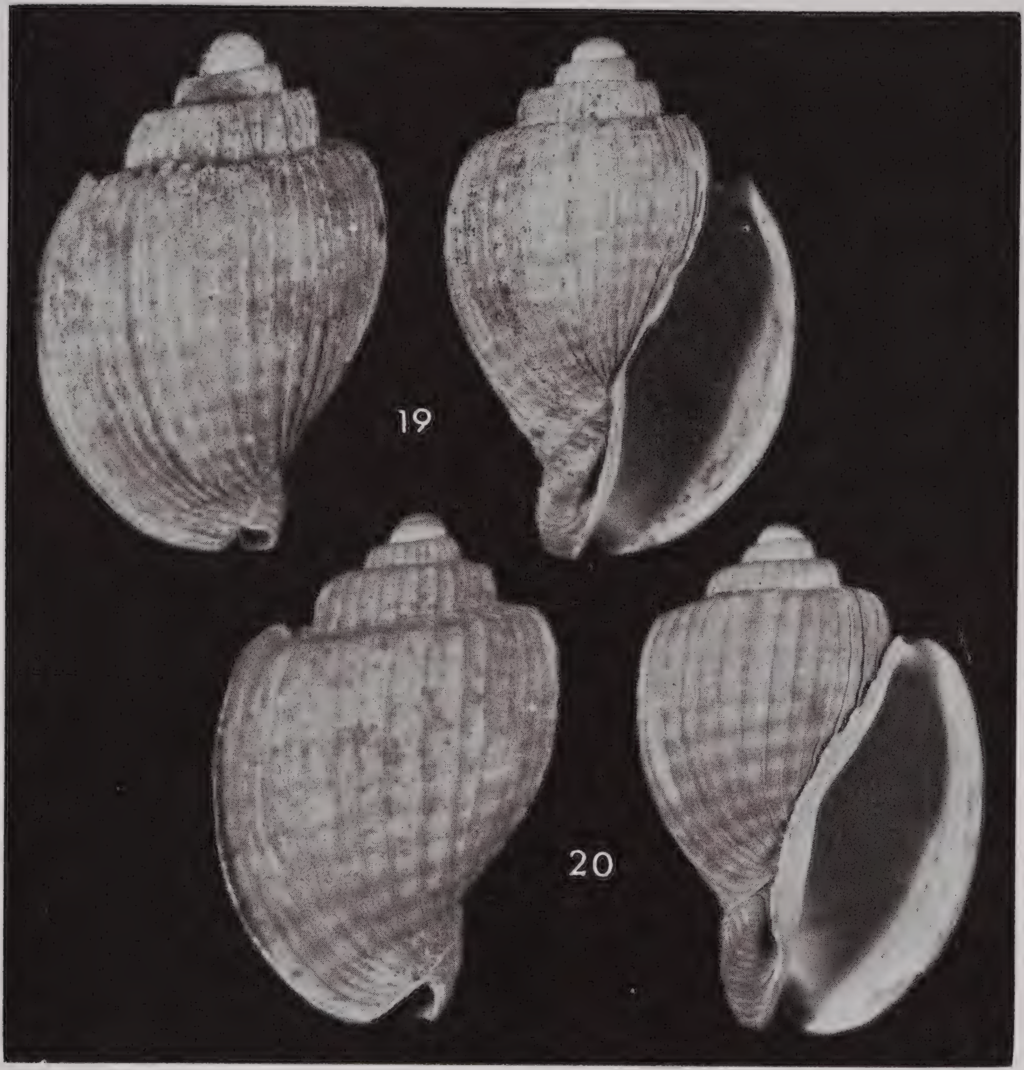
1941. *Austroharpa sulcosa* Tate, Ludbrook, Trans. R. Soc. Sth. Aust. 65 (1): 100.

1958. *Harpa (Austroharpa) tatei* (Finlay), Ludbrook, Trans. R. Soc. Sth. Aust. 81: 73, pl. 4, fig 5 (figd. holotype — figure does not agree with actual type).

1973. *Austroharpa (Palamharpa) tatei* Finlay, Rehder, Indo-Pacific. Moll. 3 (16): 269, pl. 240 (copy of Ludbrook's drawing).

TYPE LOCALITY. Abbatoirs Bore, 400-500 feet (122-152 m), Adelaide, Pliocene of Sth. Australia.

Finlay (1931) described *A. tatei* as a new species despite his own remarks that the new species is "extremely close to *sulcosa* Tate". Ludbrook (1941) considered the Adelaidean Pliocene harpid from Abbatoirs Bore to be the species *A. sulcosa* (Tate), but Ludbrook (1958) identified the Pliocene species as *A. tatei* Finlay; the drawing of the holotype of *A. tatei* as given by Ludbrook (1958, pl. 4, fig. 5) shows a slender



Figs. 19, 20. 19. *Austroharpa sulcosa* (Tate). Muddy Creek, Mid-Miocene of Victoria, Australia; 30.7 x 21.0 mm. 20. *A. tatei* Finlay. Holotype, Abbatoirs Bore, Adelaide, Pliocene of Sth. Australia; AIM No. TM-67, 25.8 x 17.3 mm.

harpid with a sloping shoulder, and is quite different in appearance from the actual holotype (Fig. 20). This erroneous drawing of *A. tatei* undoubtedly prompted Rehder (1973) to consider *A. tatei* to be a separate species from the Mid-Miocene *A. sulcosa* Tate.

The holotype of *Austroharpa tatei* Finlay, is in the Auckland Institute and Museum No. TM-67, length 25.8 mm, width 17.3 mm; the type is as angulate on the presutural ramp as *A. sulcosa* and the spiral sculpture is also equally as feeble, and under magnification, remains of some worn-down spines are visible on the axial ribs at the shoulder. The difference in the number of axial ribs between the two "species"

(*A. sulcosa* = 38 and *A. tatei* = 33) cannot be considered of specific importance since specimens of the Recent *Harpa costata* (Linnaeus) have 30-45 plus ribs on the body whorl. The Mid-Miocene specimen of *A. sulcosa* here illustrated (Fig. 19) has actually 47 axial ribs, which is quite in excess of the 38 ribs as usually cited for this species. Numerous gastropod species have a continuous range from the Mid-Miocene to the Pliocene of Southern Australia, and in my opinion *A. tatei* is only the Pliocene form of *A. sulcosa*. The holotype of *A. tatei* also bears a resemblance to the holotype of the Recent species *A. exquisita* (Iredale, 1931), suggesting an evolution from the Mid-Miocene *sulcosa* via the Pliocene *tatei* to the Recent *exquisita*.

Family TRIPHORIDAE

Genus **Viriola** Jousseaume, 1884

Viriola Jousseaume, Bull. Soc. malac. France 1: 234, 238. Type species by OD *V. bayani* Jousseaume, 1884. Recent, Indo-Pacific.

1915. *Sinistroseila* Oliver, Trans. Proc. N.Z. Inst. 47: 523. Type species by OD *Triphoris incisa* Pease, 1861. Recent, Indo-Pacific.

Viriola samoana sp. n. (Figs. 21-26)

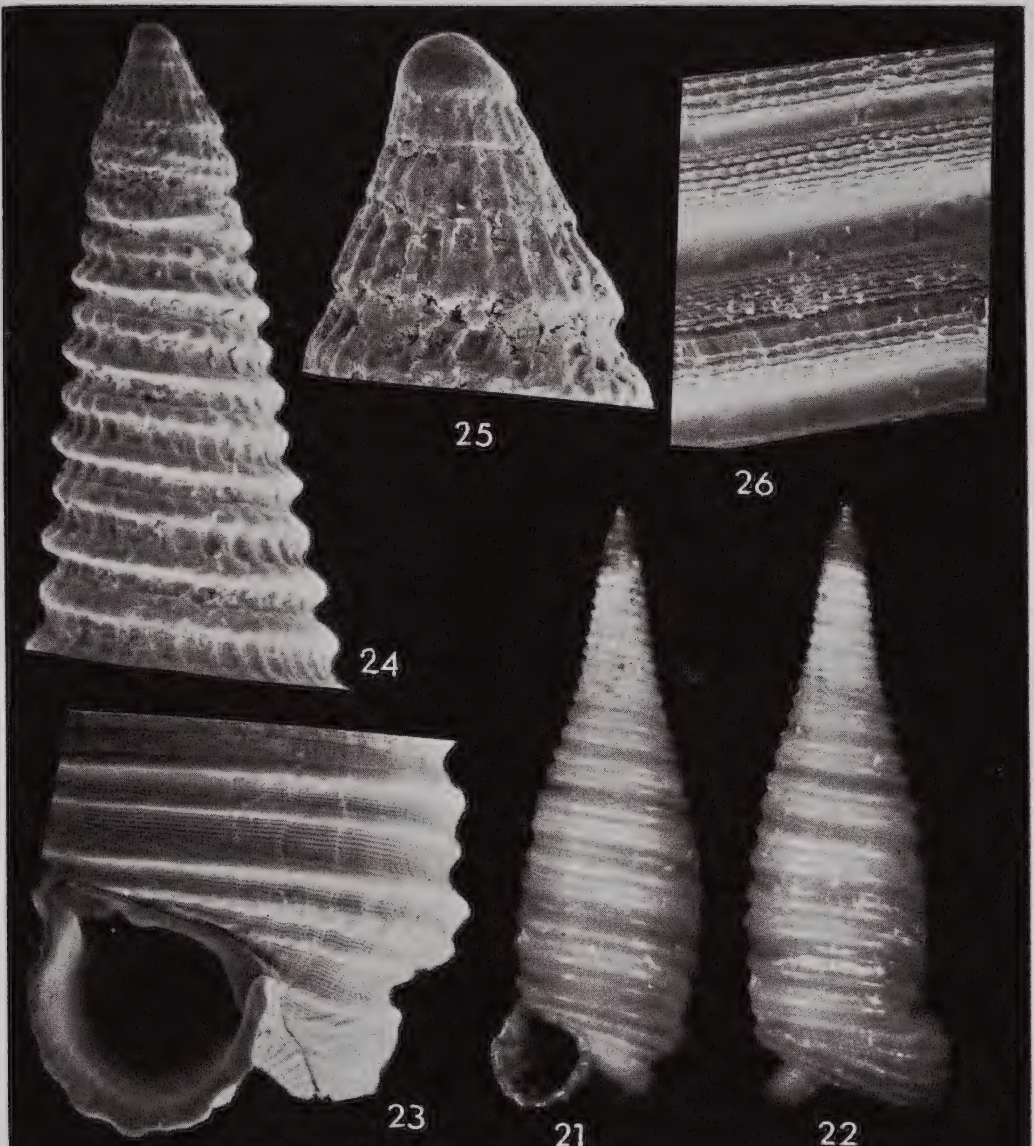
Shell very small, 6.0 mm in length, spindle-shaped, broad at the base becoming slender-acuminate towards the spire, mature whorls 15 plus a dome-shaped and somewhat pustulose protoconch of 1¼ embryonic whorls; first to third post-embryonic whorls sculptured with slender and strong axial ribs but no spiral keels, fourth whorl becoming bi-angulate through the appearance of 2 spiral keels, fifth to eleventh whorls with 2 prominently elevated spiral keels which are rendered weakly nodulose by intruding axial ribs, axial sculpture becoming obsolete on the eleventh whorl. An intermediate third central spiral cord appears on the twelfth whorl and becomes progressively larger towards the body whorl but is never as strong as the two flanking main cords; sculpture between spiral cords consists of 9-12 fine, granulose and scabrous spiral threads, peripheral cord on body whorl broader and axially plicate. Aperture almost circular, edge fluted, posterior canal appearing as a moderately deep and open sinus on the posterior edge of the outer lip, anterior canal short, broad, grooved and recurved. Protoconch and 3 post-embryonic whorls brown, following 5 whorls white and remaining 6-7 whorls very pale lilac, ornamented with brown bands between sutures.

TYPE LOCALITY. Apolima Strait, West of Upolu I, Western Samoa, dredged subtidally.

Holotype. Auckland Institute and Museum No. TM-1353; length 5.9 mm, width 1.8 mm (Figs. 21, 22).

V. samoana resembles *V. cancellata* (Hinds) and *V. intercalaris* (Gould), but differs in shape and sculpture, the latter two species having close-set spiral cords and a distinctly nodulose central cord. *V. incisa* (Pease) is also similar, but in this species the spiral cords are close-set, thick and rope-like.

The placement of *samoana* in the genus *Viriola* is only tentative. Although the sculpture and siphonal canal are the same as in species of *Viriola*, the shape of the shell is more like *Mastonia* Hinds. Both *Viriola* and *Mastonia* species have an acuminate,



Figs. 21-26. *Viriola samoana* sp. n. 21, 22. Holotype AIM No. TM-1353; 5.9 x 1.8mm. 23. Aperture enlarged; SEM photograph, x 30. 24. Spire whorls enlarged; SEM photograph, x 45. 25. Protoconch; SEM photograph, x 125. 26. Detail of sculpture on the penultimate whorl; SEM photograph, x 135.

multispiral protoconch, whereas *samoana* has a blunt, dome-shaped, paucispiral protoconch which resembles the monotypic genus *Sychar* Hinds, 1843.

Acknowledgements. I am grateful to Dr J. Taylor and Ms K. Way, British Museum (Nat. Hist.), London, for facilitating access to the type-collections. I would like to thank Dr R. Kilias, Zoological Museum, Humboldt University, Berlin, for a photograph of the type of *Mitra foveolata* Dunker, and Mr R. Willan, Zoology Department, Auckland University, for Scanning Electron Microscope photographs appearing in this paper.

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REINSTATEMENT OF *Hoplodactylus maculatus* (Boulenger) WITH REDESCRIPTION OF *H. pacificus* (Gray) (REPTILIA : SQUAMATA : GEKKONIDAE)

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Abstract. Evidence for the reinstatement of *Hoplodactylus maculatus* Boulenger is presented, based on the form of the rostral shield and the enlarged scales at the base of the tail; and the proportions of the head, ocular disc and foot. Revised synonymys and descriptions of *H. maculatus* and *H. pacificus* are given.

New Zealand has three genera of endemic geckos, of which *Naultinus* is restricted to the North Island and *Heteropholis* to the South Island, while *Hoplodactylus* occurs throughout the country, including most of the off-shore islands.

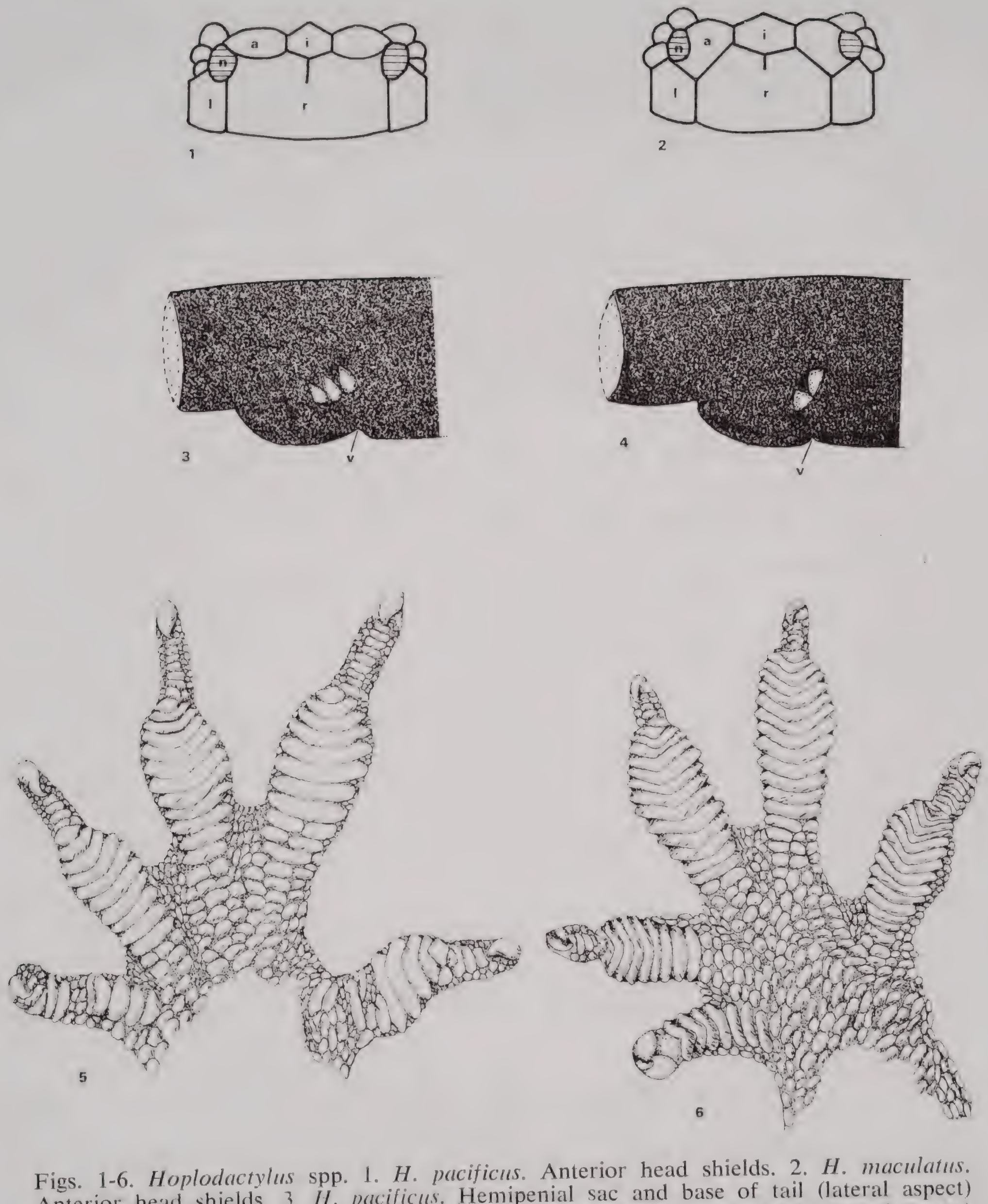
The genus *Hoplodactylus* was erected in 1843 by Fitzinger (1843) to accommodate a specimen named *Platydactylus duvauceli* Duméril & Bibron, 1836, which was thought at the time of description to come from Bengal, but was subsequently recognised as being endemic to New Zealand.

In 1842 Gray described *H. pacificus* under the name of *Naultinus pacificus* (Gray 1842). In 1845 he published his *Catalogue of Lizards* (Gray 1845) and on page 273 listed a number of corrections and amendments, which included an entry "*N. maculatus*, MSS". No description was given nor was a reference made to any specimen number, so presumably Gray had used the name *N. maculatus* somewhere in his draft manuscript, and then regarded it as part of the synonymy of *N. pacificus*.

Boulenger (1885) described *H. maculatus*, giving the synonymy as "*Naultinus pacificus* part. *(N. maculatus)*, Gray, Cat. p. 273", and listing a number of specimens (including two types) in the collection of the British Museum. As Gray had not designated any types, Boulenger presumably selected his from among the British Museum specimens.

Lucas & Frost (1897) recognised the validity of *H. maculatus*, and quoted Boulenger's description almost verbatim, but added some comments on certain diagnostic features, and on the geographical range of the species, which indicates that they themselves had nevertheless examined a number of specimens. Garman (1901) erected a new genus of gecko from New Zealand, with one species — *Woodworthia digitata*. Romer (1956) synonymised *Woodworthia* with *Hoplodactylus*, and examination of the types of *H. digitatus* in the course of the present work has established that the species is *maculatus*.

Smith (1933) also recognised *H. maculatus*, though he claimed that Boulenger's key for the genus *Hoplodactylus* was inadequate, and proposed an alternative key, based mainly on the number and shape of the subdigital lamellae of toes 2 - 5.



Figs. 1-6. *Hoplodactylus* spp. 1. *H. pacificus*. Anterior head shields. 2. *H. maculatus*. Anterior head shields. 3. *H. pacificus*. Hemipenial sac and base of tail (lateral aspect) showing enlarged scales. 4. *H. maculatus*. Hemipenial sac and base of tail (lateral aspect) showing enlarged scales. 5. *H. pacificus*. Under-surface of foot. 6. *H. maculatus*. Under-surface of foot.

a, anterior nasal; i, internasal; l, first upper labial; n, nostril; r, rostral; v, vent.

McCann (1955), after examining all specimens available in New Zealand museums, and checking Boulenger's and Smith's definitions, claimed that neither key gave adequate grounds for separating *H. maculatus* from *H. pacificus,* and concluded that "there is but a single and very variable species". Accordingly, he relegated the former species to the synonymy of the latter. Wermuth (1965) adopted the same procedure.

Sharell (1966) drew attention to the fact that there appeared to be two distinct forms of *H. pacificus,* and referred to the less common one (in his experience) as the "Hauraki Gulf gecko". This in fact has proved to be *H. pacificus.* Benson (1976) in a study of the circadian rhythm of locomotor activity of *"H. pacificus"* recorded two distinct patterns of activity, and suggested that this indicated the existence of two separate forms within the species. He described these as Type A and Type B — now identified by the present authors as *H. maculatus* and *H. pacificus* respectively.

One of us (J. R.) has made detailed examination of syntypes of *H. maculatus* and *H. pacificus* (B.M. 1946.9.8.14. and B.M. 1946.8.22.65. respectively); the types of *H. digitatus* (M.C.Z. 6153 and M.C.Z. 152218); and all relevant material in the collections of the Auckland Institute and Museum and the Department of Zoology, University of Auckland (a total of 62 specimens); backed up by a survey of material in the collection of the National Museum, Wellington (a further 54 specimens). Both of us have observed animals in the wild and in captivity. The results show clearly that *H. maculatus* is indeed a valid species. It can be distinguished from *H. pacificus* on the form of the rostral alone (Figs. 1, 2), and in the males, by the number and shape of the scales forming the enlarged group on each side of the base of the tail (Figs. 3, 4). Strangely, the first of these two features was used by Boulenger (1885) in his key to separate *H. maculatus* from the other four species that he included in the genus, and its use was implied in general terms by Lucas & Frost (1897) in their descriptions of *H. maculatus* and *H. pacificus,* but was ignored by Smith (1933) and McCann (1955). The second feature (i.e. the form of the enlarged scales at the base of the tail) seems to have been noted only by McCann, though he did not recognise it as a species diagnostic feature.

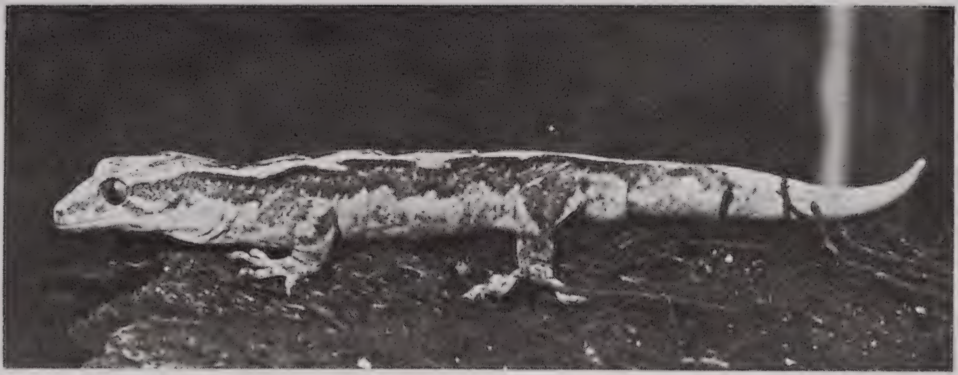
Several other characteristics, such as the proportions of the head, ocular disc and feet, are also distinctive of the two species (Table 1, and Figs. 5 - 10).

Table 1. Morphometric data relating to *Hoplodactylus pacificus* and *H. maculatus.*

	H. pacificus[1]			*H. maculatus*[2]		
	Mean numbers	Mean length (mm)	Standard Deviation	Mean numbers	Mean length (mm)	Standard Deviation
Snout/vent length		73.15	8.55		65.27	8.07
Snout/eye length		9.08	3.01		7.05	2.65
Eye/ear length		6.31	2.51		6.40	2.53
Diameter of ocular disc		4.22	2.05		3.18	1.70
No. of upper labials	12.09		3.47	10.73		3.27
No. of lower labials	11.30		3.36	10.35		3.20
4th toe						
Width of dilation		2.24	1.40		2.06	1.40
Length of dilation		5.89	2.42		5.23	2.28
Length of distal phalange		3.36	1.80		2.26	1.50
Total length of toe		8.64	2.94		7.05	2.65
No. of subdigital lamellae	12.31		3.50	11.59		3.40

[1] Sample size — 40.

[2] Sample size — 18.



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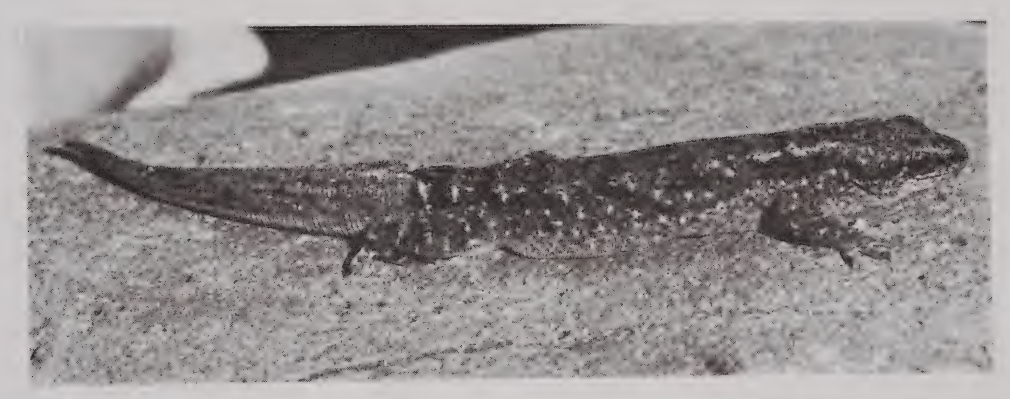

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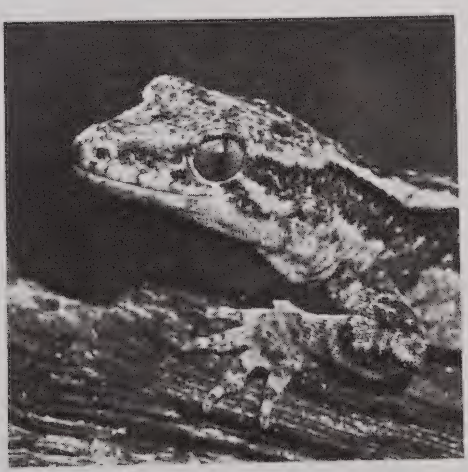

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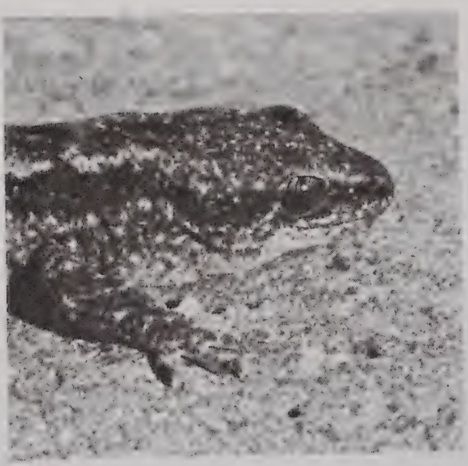

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Figs. 7-10. *Hoplodactylus* spp. 7, 9. *H. pacificus*. 8, 10. *H. maculatus*. (Photos: J. Robb).

Hoplodactylus pacificus (Gray, 1842) (Figs. 1, 3, 5, 7, 9)

1842 *Naultinus pacificus* Gray, *Zool. Misc.*, pp. 53, 72.
1843 *Naultinus pacificus* Gray, In Dieffenbach, *N. Zeal.* 2, p. 203.
1845 *Naultinus pacificus* (part) Gray, *Cat. Liz.*, p. 169.
1851 *Platydactylus pacificus* A. Duméril, *Cat. Méth.*, Rept. p. 35.
1857 *Hoplodactylus pomarii* Girard, *Proc. Acad. Philad.* p. 197.
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1867 *Dactylocnemis pacificus* Steindachner, *Novara* Rept., p. 11.
1871 *Naultinus pacificus* (part?) Buller, *Trans. Proc. N.Z. Inst.* 3: 7.
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1965 *Hoplodactylus pacificus* (part) Wermuth, *Das Tierreich* 80: 95.

Diagnosis. A medium to large-sized *Hoplodactylus;* nostril contacts the rostral for approximately ¼ of its circumference; rostral twice as wide as deep, subquadrangular; distance between snout and eye distinctly greater than the distance between eye and ear-opening; webbing between toes 2, 3 and 4 distinct; distal phalange of 4th toe usually at least half the length of the dilated portion; 3-4 enlarged, pointed, conical scales forming a fan-like group on each side of the base of the tail.

Description. Head oviform; snout distinctly longer than the distance between the eye and the ear-opening, 1.7 to 2.6 (usually 2.0 to 2.2) times the diameter of the ocular disc; forehead slightly concave; ear-opening large, oval, oblique; body and limbs moderate to robust; digits somewhat dilated, the length of the dilated portion of the 4th toe being approximately 2.6 times its width, and approximately 1.7 times the length of the distal phalange; anterior inferior lamellae slightly angular, posterior ones straight; 10-16 (usually 12-13) lamellae under 4th toe; a distinct web between toes 2, 3 and 4, but web slight between toes 1 and 2, and absent between toes 4 and 5; head covered with granular scales, of moderate size on the snout, and tiny on the remainder of the head; rostral broad, subquadrangular, in contact with the nostril, short median cleft from upper border; nostril pierced between rostral, first upper labial and 3-6 (usually 4-5) nasals, the anterior-most of which is enlarged; 1 large internasal; 9-16 (usually 11-13) upper labials, and 8-14 (usually 10-13) lower labials; mental subtriangular, shorter than, or occasionally equal to, first lower labials; dorsal scales minute, granular; abdominal scales small, juxtaposed or subimbricate; in the males, 1-4 angular series of preanal pores (9 in Stephens Island specimen), forming a roughly triangular patch, the number of pores very variable; no femoral pores (except in Stephens Island specimen); in the females a patch of enlarged preanal scales, but no pores; tail cylindrical, tapering, covered with small subquadrangular, juxtaposed scales arranged in whorls; in the males, the base of the tail swollen to accommodate the hemipenes, and with 3-4 enlarged, pointed, conical scales in a fan-like group on each side of the swelling; females usually with vestiges of the enlarged scales.

COLOUR. This species is extremely variable in colour and markings, although these normally involve shades of brown, grey, fawn, yellow-orange and olive green, and black. Dorsally there is usually a form of transverse patterning, often in rich moss-like or bark-like tones, although sometimes there are instead 2-3 longitudinal stripes. In many individuals there is a V-shaped mark on the forehead between the eyes, similar to that seen in *H. granulatus*. The ventral surface normally lacks any pattern or marking, and may be off-white, grey or brown. Some specimens have a lunate patch of mustard yellow on the nape, or the base of the tail.

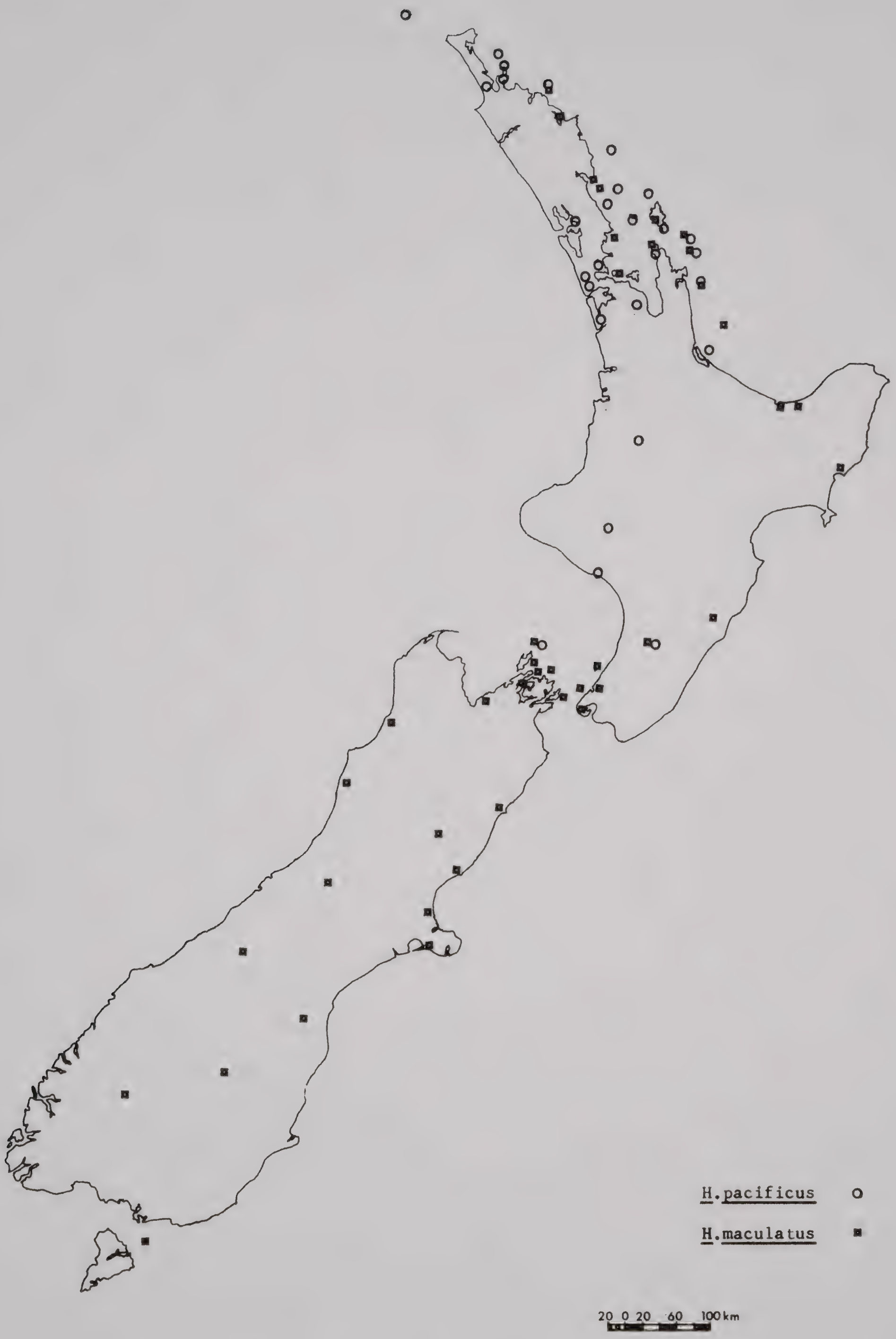

Fig. 11. Localities of specimens examined.

RANGE. In this survey, specimens of *Hoplodactylus pacificus* have been recorded from the Three Kings Islands[1] (approximately 58 km north west of the top of the North Island), from many islands off the eastern coast of the North Island, and from Stephens Island[2] at the western entrance to Cook Strait; and from a wide variety of localities in the North Island, as far south as Palmerston North (approximately 40.40°S) (Fig. 11). No specimens were recorded from the Wellington district, the islands inside Cook Strait, or from the South Island. Hutton (1872) refers to specimens from Lake Guyon, Nelson, but these, as Lucas & Frost (1897) pointed out, would almost certainly have been *H. maculatus,* which Hutton did not recognise as a separate species.

HABITAT AND HABITS. *Hoplodactylus pacificus* occurs in a wide variety of habitats, often in the same general areas as *H. maculatus.* By day, individuals shelter in cracks in clay banks; under stones, logs and debris on the ground in forest, scrub or cleared land; and under loose bark or in hollow trees. In coastal regions it does not occur as close to high tide level as does *H. maculatus. H. pacificus* is a strongly nocturnal species and emerges at night to climb about in the vegetation in search of insects and nectar.

Types. B.M. 1946.8.22.65, B.M. 1946.8.22.67.

Hoplodactylus maculatus (Boulenger, 1885) (Figs. 2, 4, 6, 8, 10)

1845 *Naultinus pacificus* (part) Gray, *Cat. Liz.,* p. 273.
1871 *Naultinus pacificus* (part?) Buller, *Trans. Proc. N.Z. Inst.,* 3: 7.
1871 *Naultinus granulatus* (part) Buller, *loc. cit.,* 3: 9.
1872 *Naultinus pacificus* (part) Hutton, *Trans. Proc. N.Z. Inst.,* 4: 172.
1885 *Hoplodactylus maculatus* Boulenger, *Cat. Liz.,* 1., p. 171.
1897 *Hoplodactylus maculatus* Lucas & Frost, *Trans. Proc. N.Z. Inst.,* 29: 271.
1901 *Woodworthia digitata* Garman, *Bull. Mus. Harvard,* 39: 4.
1955 *Hoplodactylus pacificus* (part) McCann, *Bull. Dom. Mus.,* 17: 44, Fig. 6.
1961 *Naultinus pacificus* (part) Chrapliwy, Smith & Grant, *Herpetologica* 17: 7.
1965 *Hoplodactylus digitatus* Wermuth, *Das Tierreich,* 80: 94.
1965 *Hoplodactylus pacificus* (part) Wermuth, *loc. cit.,* 80: 95.

Diagnosis. A small to medium-sized *Hoplodactylus;* nostril excluded from the rostral by the anterior nasal and first upper labial; rostral may be twice as long as deep, subpentagonal; distance between snout and eye equal to, or slightly greater than, distance between eye and ear-opening; webbing between toes 2, 3 and 4 slight or moderate; distal phalange of 4th toe seldom more than half the length of the dilated portion; in males, 1-2 bluntly conical enlarged scales on the base of the tail.

Description. Head short, oviform; snout equal to, or slightly longer than, the distance between the eye and the ear-opening, 1.7 to 3.4 (usually 2.1) times the diameter of the ocular disc; forehead not, or very slightly, concave; ear-opening moderate, oval, oblique; body and limbs slender to moderate; digits somewhat dilated, the length of the dilated portion being approximately 2.5 times the length of the distal phalange; anterior inferior lamellae chevron-shaped, the posterior ones straight; 9-15 (usually 10-13) under 4th toe; a small web between digits 2, 3 and 4 but slight between digits 1 and 2, and absent between digits 4 and 5; head covered with granular scales, of moderate size on the snout, tiny on the remainder of the head; rostral broad, subpentagonal, with a short median cleft from the upper border, rostral excluded from the nostril by the first upper labial and anterior nasal; nostril pierced between first upper labial, and 4-6 (usually 4) nasals, the anterior-most of which is considerably enlarged; 1-3 (usually 1 large) internasals; 9-16 (usually 10-13) upper labials, 8-14 (usually 10-13) lower labials; mental subtriangular or trapezoid, equal in length to, or occasionally slightly shorter than, first lower labials; dorsal scales minute, granular; abdominal scales small, juxtaposed or subimbricate; in the males three or four (occasionally more) angular series of preanal pores, and 2-4 parallel rows of femoral pores, together forming an extended triangular patch; in the females there is often a patch of enlarged preanal scales, but no pores; tail cylindrical, tapering, covered with small subhexagonal juxtaposed scales arranged in whorls; in the males the base of the tail is swollen to accommodate the hemipenes, and with 1-2 bluntly conical enlarged scales on each side of this swelling; females usually have vestiges of these enlarged scales.

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[1] The specimens from Three Kings and Mokohinau Islands are particularly robust in all dimensions.

[2] The Stephens Island *H. pacificus* may eventually require subspecific status, but more specimens are needed before this can be established. As well as the unusually large number of preanal pores, and the presence of femoral pores mentioned above, the only male examined had a small mental shield, flanked by very large anterior lower labials.

COLOUR. This species shows much the same range of variation of colour and pattern as does *H. pacificus;* colour is therefore of little use in distinguishing between the two species.

RANGE. *Hoplodactylus maculatus* occurs widely throughout New Zealand (Fig. 11). It has not been recorded from the Three Kings Islands, but is common on the Cavalli Islands off the east coast of Northland (35.00°S), and on most of the other off-shore islands south of the Cavalli group, including those in Cook Strait. It is found in the North Island, particularly in coastal regions, and is common in a wide variety of habitats, both coastal and inland, in the South Island.

HABITAT and HABITS. *Hoplodactylus maculatus* occurs in the same general types of habitat as does *H. pacificus,* but tends to be somewhat less arboreal than the latter species, and is more frequently found under stones, logs and debris in cleared areas; on shingle beds; and in coastal areas, within a few metres of high tide level. It tends to be active both day and night, but in general remains under cover during its periods of daylight activity, except when basking. It also has a more sluggish appearance than *H. pacificus,* keeping its head and body close to the ground (Fig. 8), whereas *H. pacificus* moves about with the head and forepart of the body slightly raised (Fig. 7).

Types. B.M. 1946.9.8.14, B.M. 1946.9.8.15.

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Metavelifer multiradiatus (Regan, 1907) (PISCES : VELIFERIDAE), A NEW RECORD FROM NEW ZEALAND WATERS

A. B. STEPHENSON

AUCKLAND INSTITUTE AND MUSEUM

Abstract. Two specimens of *Metavelifer multiradiatus* (Regan) captured in north-eastern coastal waters constitute the first record of this species in New Zealand.

Trawl captures of *Metavelifer multiradiatus* (Regan, 1907) in north-eastern coastal waters are of little surprise since the species has been widely recorded (Regan 1907, McCulloch 1914, Smith 1951, and Walters 1960) in other warm-temperate seas. Although never found in any great numbers it shows remarkably constant morphometric and meristic characters and is easily recognised.

Family VELIFERIDAE

Metavelifer multiradiatus (Regan, 1907) (Fig. 1)

1907 *Velifer multiradiatus* Regan, Proc. Zool. Soc. Lond. Pt. 2: 633-634; 1914 McCulloch, Zool. (biol.) Results Fish. Exp. F.I.S. "Endeavour" 2 (3): 77-165.

1951 *Velifer multispinosus* Smith, Ann. Mag. Nat. Hist. 12 (4): 497-510.

1960 *Metavelifer multiradiatus* (Regan), Walters, Copiea 3: 245-247.

Material examined. Off Ocean Beach, Whangarei; trawled 30-35 fm (55-64 m), 14 Mar. 1976. Auckland Museum Am. 1976. A single specimen 176 mm in standard length, 110 mm at greatest body depth. Head length 50 mm and eye diameter 15 mm. D xxi 21(22), A xix 16, P 1 + 15, V 1 + 8, Gill rakers 11. Desciduate nature of scales prevents an accurate assessment of the lateral line.

Though slight damage has occurred along the dorsal fin, anterior elements appear to be true spines except D sp. 6-8 which are distally segmented. In this respect there is considerable agreement with Hawaiian material described by Walters (1960). Moreover this evidence is seen to support Walters (1960) who suggested a late development of spines from bony rays, rather than the stricter interpretation of their origin and development taken by Smith (1951). In all other respects this specimen largely agrees with descriptions provided by Regan (1907) and McCulloch (1914) though in terms of Australasian material is larger than those seen by McCulloch (1914).

Rec. Auckland Inst. Mus. 14: 143-144 10 December 1977

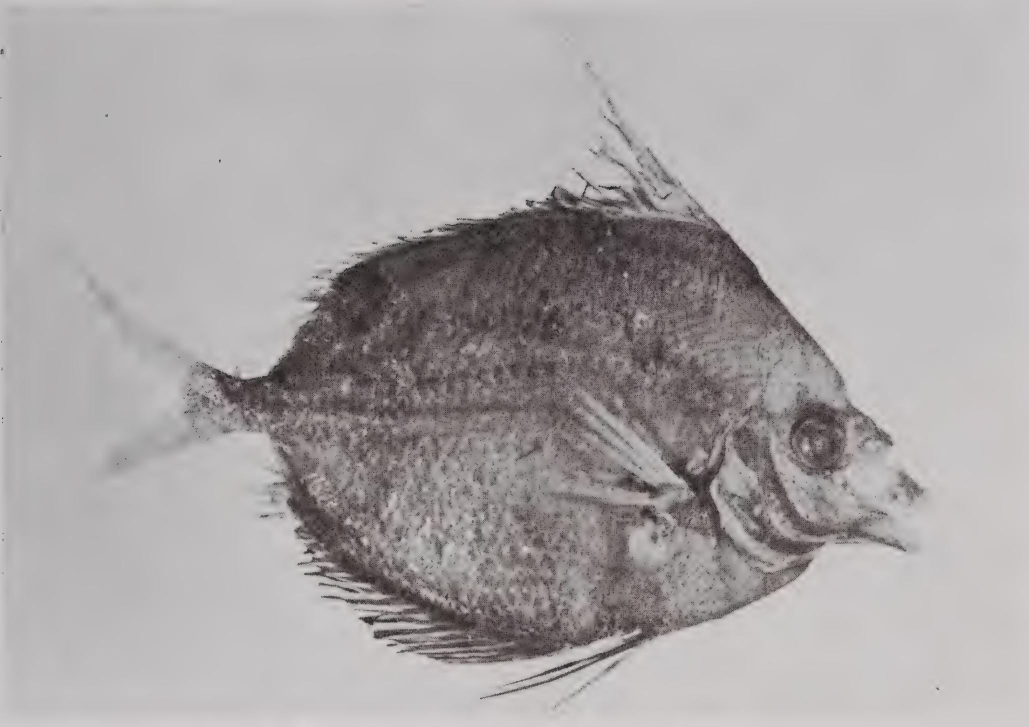

Fig. 1. *Metavelifer multiradiatus* (Regan). Lateral view.

Recently, a further specimen of *Metavelifer multiradiatus* has been trawled near Mercury Island, Coromandel, May 1977, (L. J. Paul, Fisheries Research Division, pers. comm.). This specimen 214 mm in standard length, D xix 21, A xvii 17, Lat. L c 41, is deposited at the National Museum (NMNZ 7343).

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